THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVIII. No. 709.] LONDON, DECEMBER 12, 1876. [28TH YEAR.] Price 6d.

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GAS-RETORTS, introduced 1838. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

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(Mixed ready for use).

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They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.

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(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
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JOSEPH COWEN and CO.,
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Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."

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Established at the commencement of Gas Lighting.
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FOR THE ENGLISH GOVERNMENT
AND FOR THE GOVERNMENT OF THE NETHERLANDS
AND OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government,
AND MANUFACTURERS OF
IMPROVED DRY GAS-METERS
Warranted to Measure correctly & not to vary.

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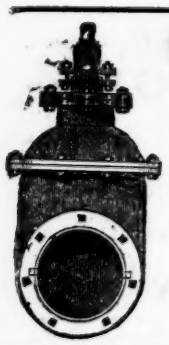
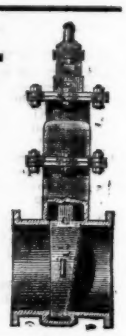


C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

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STREET-LAMP METERS in CAST-IRON CASES.

LAMP COCKS AND BRASS FINISHING IN ALL ITS BRANCHES.

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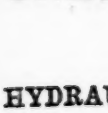

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The only Prize Medal awarded for TUBES & FITTINGS.

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AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

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(Successors to JOHN WILLIAM O'NEILL & CO.,)

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CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

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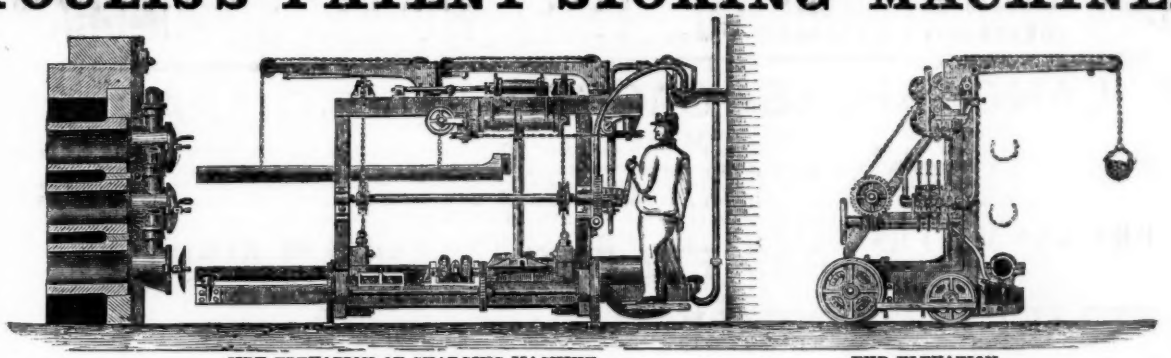

SIDE ELEVATION OF CHARGING MACHINE. END ELEVATION

(*The Drawing Machine will be Illustrated in next week's Advertisement.*)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz:

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WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

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Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

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IMPERIAL METER COMPANY,

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MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND

REGULATORS FOR THE AVERAGE METER SYSTEM.

Attention is called to their Dry Meters in Wood Cases, as used by the principal London Gas Companies. These Meters are especially suitable for seaport towns and for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

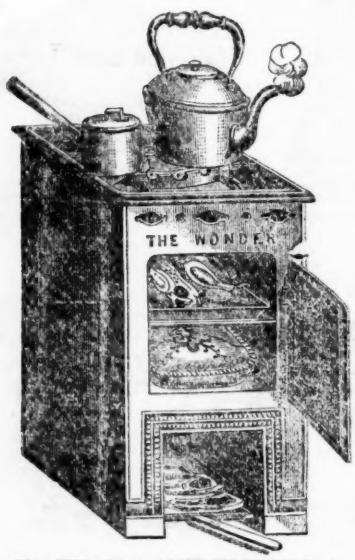
Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.



Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

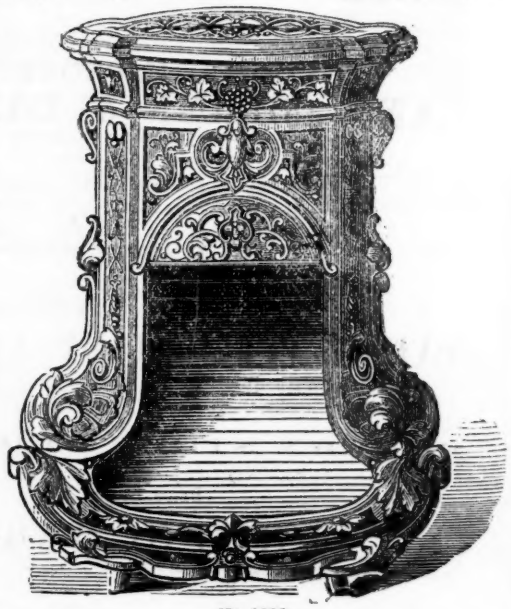
BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.



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THE CHEERFUL GAS STOVE, with Copper Reflector,

Has all the appearance of a Bright Fire.

PRICE from 32s.

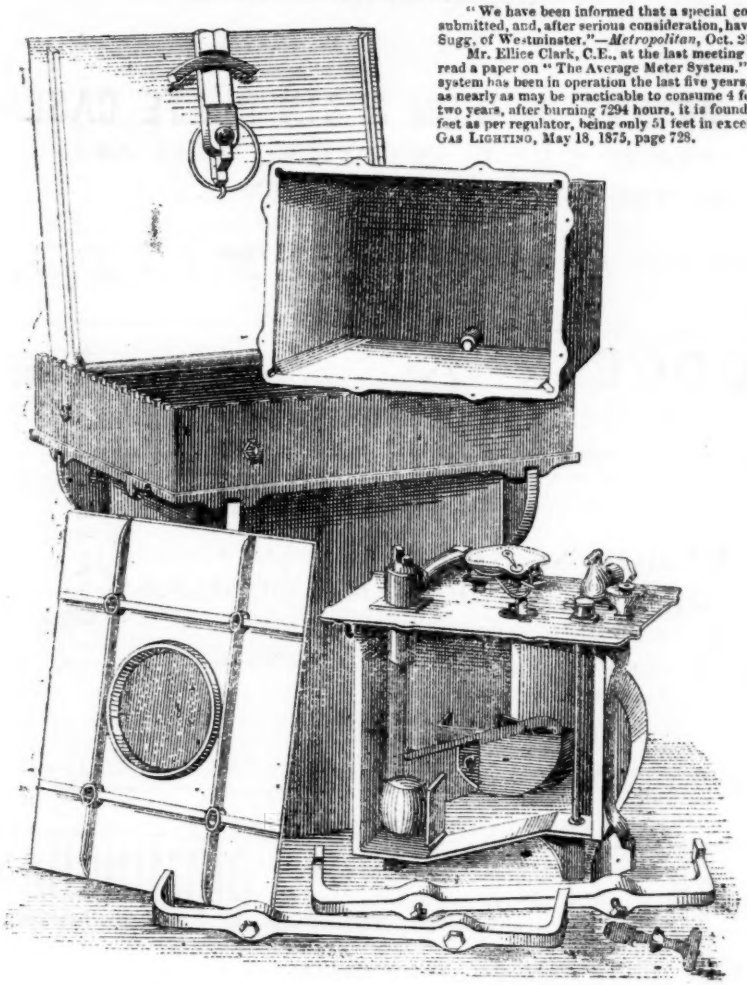
PUBLIC LIGHTING ON THE AVERAGE METER SYSTEM.

PATENT PUBLIC LAMP METERS,

AS NOW ADOPTED BY THE PARISH OF ST. MARY ABBOTTS, KENSINGTON.

"We have been informed that a special committee made a most exhaustive examination of the sample meters submitted, and, after serious consideration, have selected the new Patent Public Lamp Meter, invented by Mr. William Sugg, of Westminster."—*Metropolitan*, Oct. 21, 1876.

Mr. Ellice Clark, C.E., at the last meeting of the Association of Municipal and Sanitary Engineers and Surveyors, read a paper on "The Average Meter System." Referring to Folkestone, he said that "The Average Meter Indicator system has been in operation the last five years, and found to act well. Sugg's Self-Acting Regulator is used, adjusted as nearly as may be practicable to consume 4 feet per hour, and so very satisfactory is this apparatus that, for the last two years, after burning 7294 hours, it is found by the Average Meter to have consumed 29,227 feet, as against 29,176 feet as per regulator, being only 51 feet in excess of that which the apparatus is adjusted to consume."—JOURNAL OF GAS LIGHTING, May 18, 1875, page 728.



SUGG'S IMPROVED
LIGHTING TORCH.

WILLIAM SUGG'S
IMPROVED PATENT LAMP METER,

With adjustable Lid to suit the Slope of any Pavement.

Can be easily cleaned and repaired by any ordinary workman. Improved index and patent flexible joints. The inlet service and the connexion to stand-pipe can be cleaned out without opening the ground the lid covers both of these. Clear glass plate on internal lid.

SUGG'S IMPROVED
LAMP COLUMN & LANTERN,

AND THE METHOD OF FIXING THE AVERAGE METER.

NOTE.—This kind of Meter was originally invented by William Sugg, in conjunction with Mr. Thomas Mawksley, Past-President of the Institute of Civil Engineers. They were first used at Nottingham in 1866, and are still at work. The Gaslight Company and the Corporation were both quite satisfied with the results. They were also introduced at Folkestone in 1869 by the late Mr. T. G. Barlow, Editor of the JOURNAL OF GAS LIGHTING. The success of the system put an end to a very long and troublesome dispute between the gas company and the local authorities. They are still at work with the same satisfactory results. They have since been used in several important towns, with equally good results.

No other kind of Lamp Meter has ever achieved so complete a success.

SMALL SIZE
LAMP GOVERNOR
For the inside of Lantern, with double regulation.

WILLIAM SUGG'S
PATENT PUBLIC LAMP GOVERNOR,

With Steatite Incorrodible Burners.

Guaranteed to give the greatest amount of light for the quantity of gas consumed. Nearly a Million of these, and those of William Sugg's later inventions, are in use in various parts of the globe.

MODERN STREET LIGHTING.

BY WILLIAM SUGG, A.I.C.E.

Price 1s. 6d.

LIGHTING TABLE.

Diagram showing the Curves of Sunset and Sunrise throughout the Year.

Price 2s. 6d., Litho.

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VINCENT WORKS, VINCENT STREET, WESTMINSTER.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

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" " Glazed Bricks: A. BARFIELD, 22, Great George Street, Westminster.

LIVESEY FIRE-CLAY WORKS.

NEAR BLACKBURN, LANCASHIRE.

(ESTABLISHED 1835.)

ORLANDO BROTHERS, LIMITED,

MANUFACTURERS OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS

SIZE STRENGTHS &c. OF ROLLED JOISTS.

A	B	C	D	E	A	B	C	D	E
41	15¾	7"	102	810	19	6"	5"	30	85
1	16"	5½	57½	400	17	6¼	3"	18	45
31	15"	5"	50½	330	18	6¼	2"	10¾	30
3	14"	5½	60	325	20	5½	2"	10 1/2	22½
4	12"	6"	56	300	35	5½	2¾	12½	30
5	12"	5¼	42	220	23	5"	4½	23	55
30	10	5"	36	173½	22	5"	3"	13	30
8	10"	4½	32	130	36	4¾	2"	8	17½
32	9½	4½	25	116	40	4"	3"	11	20
9	9¼	3½	24 & 30	90	25	4"	2"	8½	14
33	8¾	2¾	18	60	37	3"	2"	5½	10
12	8"	4"	22	80	38	3"	3"	9	17½
11	8"	5"	29	95	A	No on Section Sheet			
13	8"	2½	15	40	B	Depth in Inches			
39	7"	4"	22½	70	C	Width of Flange			
15	7"	3½	19	60	D	Usual Weight Per Ft			
16	7"	2¼	14	35	E	Constant.			

TO FIND SAFE DISTRIBUTED LOAD IN TONS DIVIDE THE CONSTANT BY THE SPAN IN FEET.

ROLLED JOISTS & FLITCHES KEPT IN STOCK

CHAS WILLIAMS, & Co,

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SECTION SHEET, AND PARTICULARS ON APPLICATION TO THE ABOVE.

BATES'S PATENT. No. 660. FEBRUARY, 1875.

BATES'S PATENT APPARATUS

For Attaching Main Cocks, Valves, or other Connexions, to Service-Pipes when under Pressure.

Sole Makers and Licensees:

HAYWARD TYLER AND CO.,

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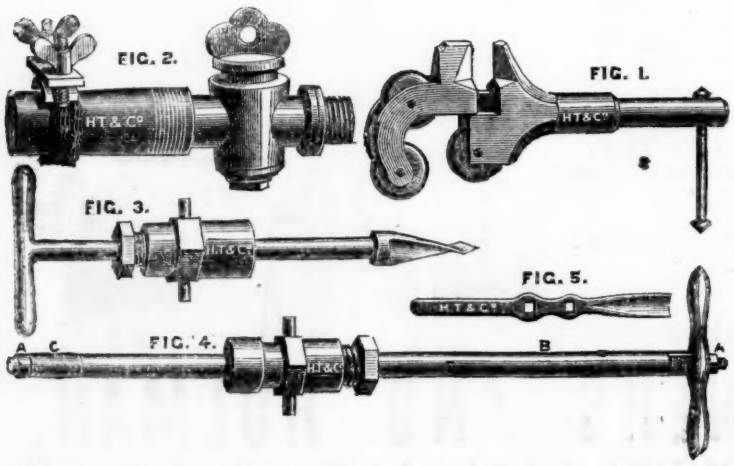
84 & 85, UPPER WHITECROSS STREET, LONDON.



PRICES.

Set of Tools for making Attachments to ¾-inch Lead Services	£3	0	0
Plug and Stuffing Box for ⅝-inch Service extra . .	0	10	0
Plug and Stuffing Box for ½-inch Service extra . .	0	10	0
Complete Set for the 3 Sizes.	4	0	0

The Prices Quoted comprise the whole Set of Tools, by the aid of which the patent process is rendered so simple that any plumber can work it after having it once explained, or reading the printed instructions. The tools are light and handy, and no trouble to carry about. The Joints can be made in any of the ordinary ways.

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

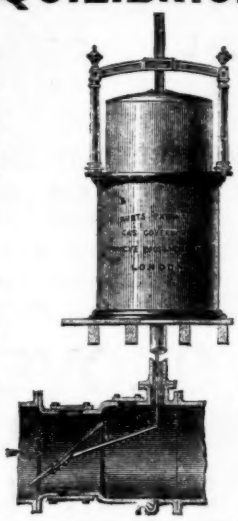
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

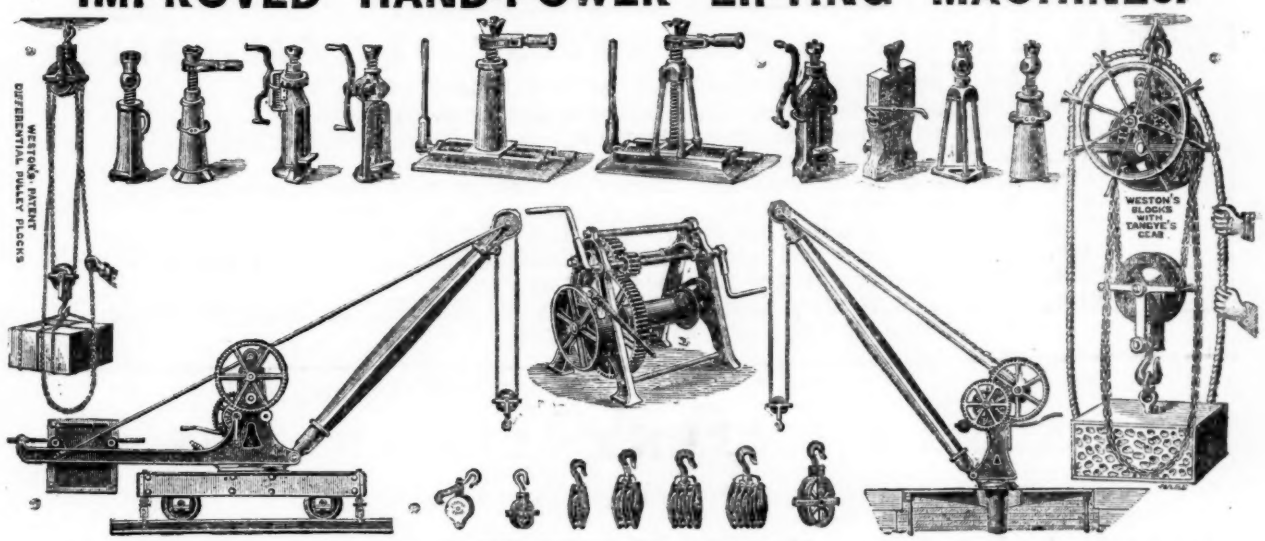
MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

IMPROVED HAND-POWER LIFTING MACHINES.

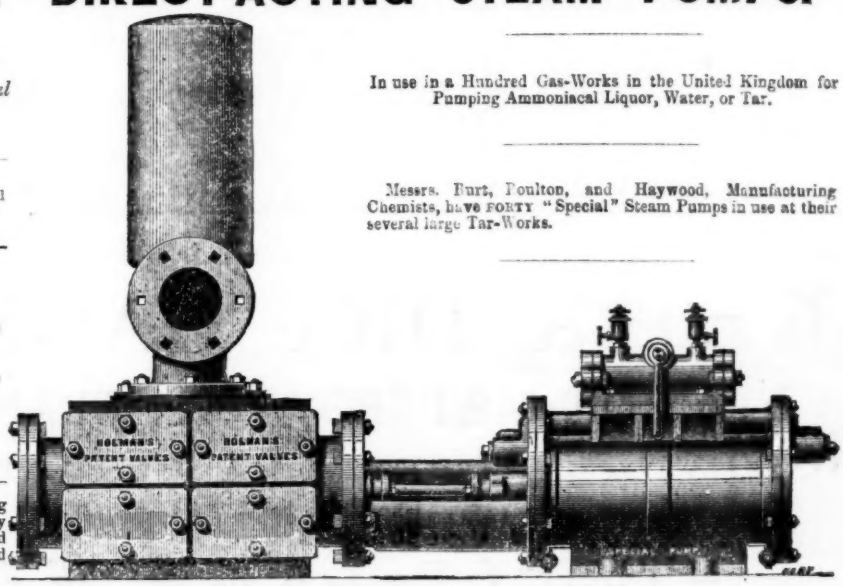


THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

The following are a few of the leading Sizes in use in Gas-Works and Chemical Works:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4*	2	9	815	18
3	3	9	1,830	18
5	2½	12	1,250	21
5*	3	12	1,830	22 10
4	4	12	3,250	25
6*	4	12	3,250	30
5	5	12	5,070	32 10
7*	5	12	5,070	40
6	6	12	7,330	40
8*	6	12	7,330	50
7	7	12	9,750	50
10*	7	12	9,750	65

* These sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance piece between steam and pump cylinder at a small extra cost.



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have FORTY "Special" Steam Pumps in use at their several large Tar-Works.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.

London 1851. New York, 1853 Paris, 1855. London, 1862.

Dublin, 1865

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE TREATISE ON GAS LIGHTING.—*We have had many communications during the last fortnight, from subscribers residing in remote districts, apprising us of the difficulty experienced by them in obtaining our new work, their local booksellers having no regular town agency. We have, therefore, arranged to forward the "Treatise" by post, securely packed on a wooden roller, at the cost of the number and postage only—viz., 1s. 2d. monthly, or 7s. for the half year. The cost of single parts can be remitted to the Publisher in postage stamps.*

N. T., Strabane.—*All meters used since* 1870 *must be stamped in accordance with the Sales of Gas Act,* 1859, *whether they be supplied by the company or the consumer, under a penalty of £5 and liability to seizure.*

S. E.—*You will find the information you require respecting the adoption and working of the Average Meter System in the following numbers of this* JOURNAL:—*No.* 409 (*Nottingham*), *No.* 627 (*Ramsgate*), *No.* 640 (*Paddington*), *No.* 670 (*St. Pancras*).

LETTERS RECEIVED.—*W. J., Kingsbridge; W. Young, Clippens.*

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 12, 1876.

Circular to Gas Companies.

IN our last "Circular," and with reference to the projected purchase of the Warrington Gas Company by the Corporation of that borough, we quoted a remark, found in a Warrington paper, that Dr. Farr had set the value of a statutory gas undertaking at seventeen years purchase. On referring to the source indicated—the *Journal of the Statistical Society*, for September last—we find that, in May, Dr. Farr read a paper before the Society, "On the Valuation of Railway, Telegraph, and other Commercial Companies." A cursory glance over this paper might lead the reader to believe that it was written by an official, with a view to depreciate the value of all commercial undertakings, on the supposition that they would, some day, be bought up, either by the Imperial Government, or some Municipal Authority. Allowing that every case of purchase must be dealt with on its own merits, Dr. Farr's principle of valuation appears to be based on the average market price of stock extending over many years, as representing profits speculatively capitalized. Applying this to the case of the Metropolitan Gas Companies, on the assumption that they might be bought up by the Board of Works, the writer remarks that, "At "present (May, 1876), the dividends are ten per cent., the price "of £100 of share capital is £171, so that the new investor pays "seventeen years purchase for his dividends." It is thus insinuated that the value of the metropolitan gas undertakings in May last, was seventeen years purchase of their maximum dividends. Dr. Farr, we rather think, makes a somewhat serious mistake in his statement of the market price of shares in May; but it does not matter. If he had quoted the actual price, which would have represented about twenty years purchase of dividends, the value would still have been below that which has been invariably assigned when the absolute sale of a statutory gas or water undertaking has been negotiated and sanctioned by Parliament.

Our thoughts have been drawn to this question by a recent study of the Act of Parliament, which virtually confiscated the undertaking of the Stockton and Middlesbrough Water Company—we say confiscated, inasmuch as it took the undertaking from the company against their will. This Act will be constantly quoted as a precedent, and it really constitutes a precedent in a double sense. It, unfortunately, makes lawful a compulsory purchase, which we regard as an act of confiscation; but, at the same time, it sets a parliamentary value on all such property. The terms of sale and purchase are by no means novel. They are just those which have been agreed upon between the parties, and *sanctioned* by Parliament over and over again; but in this case they have been *fixed* by Parliament. And what are the terms? We may here briefly recapitulate them. The joint Corporations of Stockton and Middlesbrough are to pay the shareholders in the Company either annuities, equal to maximum dividends, or twenty-five years purchase of those dividends, and are further to pay a bonus or per centage, to be settled by agreement, as compensation for compulsory purchase. The Corporations also take over the mortgage debts, and other liabilities of the Company, excepting, of course, trade debts.

These, then, Dr. Farr notwithstanding, are the terms which Parliament will sanction or insist upon when a question of purchase, compulsory or other, is considered. When commenting on the Stockton and Middlesbrough Act, as soon as it had passed, we admitted that these terms were fair, and even liberal, and that they were such as any company might accept. On similar terms the Metropolitan Board may, we have no doubt, get possession of the metropolitan gas undertakings, and then would have an excellent bargain, as the Corporation of Warrington will have, if they can succeed in inducing their constituents to consent to the purchase.

We shall, in a future number, or numbers, give Dr. Farr's remarks on the value of the metropolitan gas and water undertakings, but we hope that many of our readers will peruse the entire paper in the journal we have mentioned. They will find much instruction and some amusement. One thing will, perhaps, strike them, and that is the fallacy running through Dr. Farr's argument, that when a gas or water undertaking passes into the hands of a local authority it ceases to be a monopoly. In one sense this is true, but in another the undertaking becomes the strictest of all monopolies. Consumers have some chance in successfully fighting a gas or water company, but they have none in struggling with a local authority. A Corporation may laugh at all complaints, and continue to do just as they please. To-day, for example, the local papers teem with complaints of the quality of the gas supplied by the Corporations of Glasgow and Leeds. Whether or not they are well founded, of course, we do not know; but, supposing they are true, we know well that a gas company would very soon be compelled to remove the cause of complaint, while the large northern Corporations may close their ears to all remonstrance. It is not, in fact, until an undertaking gets into the hands of a local authority that it becomes a real monopoly.

Notices have been given of thirty-nine Bills, relating to gas undertakings, to be introduced in the next session of Parliament. Two, if not three of these will raise a question as to compulsory purchase, and enable us to see how far Parliament are disposed to follow the precedent referred to above. The Isle of Thanet Gas Company will stoutly oppose the Bill of the Ramsgate Local Board; and, so far as we yet know, the British Gas Company have not yielded to the request or demand of the Town Council of Hanley. There appear to be one or two "filibustering" Bills in preparation, but we shall not notice them until we have the actual texts of them. An interesting contest is promised in connexion with gas affairs at Limerick. If the Bills go before a committee, we shall be enlightened as to the true state of gas affairs in the City of the Violated Treaty, as regards which we must confess ourselves at present rather mystified. According to the programme, the Corporation, or the United General Company, or possibly both, will disappear as gas makers and distributors in Limerick.

We are glad to see an unusual number of unincorporated Gas Companies applying for special Acts, or, what is pretty nearly the same thing, for Provisional Orders under the Gas and Water Works Facilities Act, 1870. In these critical days we hold that no Company, however small, should be without some sort of statutory authority. The protection and privileges it confers are

great; the obligations it imposes are only reasonable and just. We may repeat once more, that, in face of the Public Health Act, 1875, no gas company in the district of an urban, or even rural, sanitary authority—and where, now, can they be outside one or the other?—should be without statutory powers.

We can entirely sympathize with Mr. Alderman Chamberlain, when he comes to make a statement respecting the gas affairs of the Corporation of Birmingham. We have been corrected, and, therefore, shall not say that the prospects of the undertaking are not all that fancy or figures pictured. We must wait for the balance-sheet before we can know the actual profit made, but we have the opinion of the worthy alderman, that, whatever they may be, they will not justify any reduction in the price of gas. Speaking candidly, and having regard to the position of affairs outside the borough of Birmingham, as we described them last week, we think it would be most unwise in the Corporation to reduce the price of gas at present. We may congratulate the Corporation on what has been done in the way of relaying mains and removing duplicate service-pipes. Thirteen and a half miles of mains saved, and the effectual prevention of any more Ratcliffe frauds, is something to have accomplished. When they are doing so well, we think it unadvisable for the Corporation to indulge in works of supererogation. They are only required to supply fifteen-candle gas, and there can be no reason why they should furnish seventeen and a half candles, and thereby reduce the consumption. We hope now that we shall hear no more of exaggerated gas accounts, of which no explanation can be given. In anticipation of the balance-sheet which will be presented, we may here express a hope that the Gas Committee of Birmingham will imitate the Nottingham Committee, and give us the accounts in the form prescribed (as near as is possible) for the Metropolitan Gas Companies.

The Balsall Heath Local Board of Health have not gone to Parliament, as they might have done, to obtain power to purchase such part of the gas undertaking of the Corporation of Birmingham as lies within their district; but they would seem to have made a sort of appeal, *ad misericordiam*, to the Corporation, to be allo ved to do so, and manufacture gas for themselves. They object, also, to the charge made for public lights—viz., £1 3s., which is certainly not unreasonable. The Board have now, we think, lost their chance of separating themselves from the Corporation of Birmingham, and we regard it as a fortunate thing for them. Mr. Chamberlain will, no doubt, concede to them the favour of lighting and extinguishing the public lamps in the district, and the Board may save what they can by the change; but, as regards the manufacture of gas, the Board may be assured that the Corporation of Birmingham can do very much better for them than they can do for themselves.

The proposed purchase at Warrington, and the present position of affairs with regard to it, have been casually referred to above. So far as we can learn, no day has yet been fixed for the poll of the ratepayers, and we may take it that the delay will enable the ratepayers to make themselves better acquainted with the merits of the question. We shall not be sorry if the decision be adverse to the proposal of the Town Council; but our opinion as to the advantages of the purchase to the borough will remain unchanged.

A curious case is reported at Swansea. The lessee of the Exchange Buildings in that town has paid a deposit to the Gas Company by way of security for the hire of three sixty-light meters; but it appears that the occupier of each set of offices in the building has his own meter, and pays his own gas account directly to the Company. Under such circumstances, the right of the Gas Company to require a deposit from every consumer in the building would seem to be beyond doubt. It has, however, been contested, but unsuccessfully, as will be seen in another column. We do not suppose that such a dispute could occur outside Swansea, where personal feelings are so much mixed up with gas affairs, and therefore the case need not be further alluded to, except to remark that, supposing the guarantee of the lessee to have been accepted, a deposit of £20 was a ridiculous sum as security for the gas to be consumed in fifty or sixty offices during a winter quarter in Swansea.

Water and Sanitary Notes.

A "PILIBUSTERING" Water Bill is somewhat of a novelty; but one seems to be projected for next session. It will be seen, in another column, that, last session, the York New Water-Works Company obtained additional powers, and it might have been supposed that they would have been allowed to exercise in peace the powers thus conferred. Such, however, it would seem, is not to be the case. Our last week's issue contained the announcement, that a Bill would be promoted, next session, by a "York "City Water Company," the object of which is to be to obtain power for the Corporation of York, or the present Company, or for a Company to be incorporated by the proposed Bill, to establish new water-works, or for the transfer of the undertaking of the York New Water-Works Company to the Corporation. We may well suppose, that the present Company are not parties to this Bill, and, therefore, must regard the Bill as an attempt to gain possession of the water undertaking by a side-wind. The Corporation of York have hankered after the water undertaking for some years, and we believe we are right in stating, that the original Municipal Corporations (Borough Funds) Bill was brought forward by Mr. Leeman to enable the Corporation of York to spend public money in an endeavour to confiscate the Water Company. The Water Company are, we believe, popular in York, and the form in which the Borough Funds Bill passed effectually checked the designs of the Corporation. According to appearances, however, the latter are now desirous to obtain, as we have said, by a side-wind, what they could not secure directly. We may be prejudging the case, and, until we see the Bill itself, and the names on the back of it, we are hardly in a position to judge of the scope of the measure. We cannot suppose that the Corporation, any more than the existing Company, are parties to the Bill, or, as a body, favourable to its promotion. They might, last session, have acted the same part as the Stockton and Middlesbrough Corporations, with a like success; but next session, unless we are greatly mistaken, they have no chance whatever.

The filthy condition of the water-butts of the poor has often been remarked. Major Bolton, gifted with almost supernatural powers of vision, observes their disgustingly polluted state as he is whisked along the suburban metropolitan railways. No railway has, however, afforded him a view of the cistern on the roof of the Mansion House, or he would have seen a sight not to be surpassed in the back slums of Bethnal Green and Bermondsey. We hope the report exaggerates the facts, but we read that on the surface of the water in the large cistern at the Mansion House there was found a layer, three-quarters of an inch thick, of "fungi-scrub," whatever that may be; and that at the bottom of the cistern there was a deposit of "mud," a third of an inch deep. It is fair to say that, so far as we have seen, this condition of things has not been laid to the blame of the New River Company, who supply the Mansion House with water. No one, happily, goes to the Mansion House to drink water, except the unfortunate wretches who temporarily occupy the cells in the basement. It is, however, unpleasant to read that a decanter of water on the Lord Mayor's table contained hundreds of "nematoid worms," harmless enough in themselves, for, like live oysters, they die, and are digested in the human stomach. The cisterns will, no doubt, be properly cleansed, if the British Workman of the day can be persuaded to do anything properly; but when we receive an invitation to the Mansion House, we shall not drink water, unless—but the reservation we keep to ourselves.

Colonel Cox has reported to the Local Government Board on the Conference held at the Surveyors Institute, and has suggested that a further, and in this case an official, inquiry should be held to settle the vexed question of the drainage of the middle portion of the Thames Valley. Our own opinion, that a combined scheme is most desirable, has been repeatedly expressed, and we have said that, as there was no hope of the several Local Boards agreeing to promote one, it would be necessary for the Local Government Board to step in, and, exercising the powers conferred by the Public Health Act, constitute an united district. This, we take it, will be the upshot of the new inquiry. It is reported that the Thames Conservancy Board are about to press for penalties against the Hampton Wick Local Board, amounting to many thousands of pounds. This can hardly be true, for there are vastly greater offenders than the Local Board in question. Moreover, the projected inquiry will be an effectual bar to the recovery of the penalties sued for.

[Since the above was written, the summons against the Hampton Wick Board has been adjourned for six months.]

GAS AND WATER LEGISLATION IN 1876.

(*Continued from page* 803.)

The following Acts confer additional powers in connexion with the supply of both gas and water:—

The *Chesterfield Water and Gas Act* authorizes the Chesterfield Gas and Water Company to raise additional capital to the amount of £120,000, and to borrow £30,000 in respect thereof. The dividends on the new capital are limited to seven or six per cent., according as it is raised by ordinary or preference shares. The Act authorizes the purchase of additional lands for water-works. It applies the Act of 1871 to the gas undertaking, and prescribes fifteen-candle gas to be tested by Sugg's "London" Argand, No. 1, or any other burner which may for the time being be approved by the Gas Examiner at the request of the Company.

The *Halifax Water and Gas Extension Act* empowers the Corporation of Halifax to make considerable extensions of their water

and gas undertakings. For water purposes they obtain power to raise £300,000, and for gas purposes £75,000. The Act of 1871 is applied to the gas undertaking, and fourteen-candle gas, tested by Sugg's "London" Argand, No. 1, is to be supplied. Some strong general powers are conferred by the Act in relation to the sanitary condition of Halifax.

The two following Acts incorporate Companies with statutory powers for the supply of water:—

The *South Hants Water Act* incorporates a Company with power to supply water to Romsey, and some neighbouring parishes in the county of Southampton. The source of the water is to be a well in the parish of Timsbury. Authority is given to raise capital to the amount of £50,000 in £10 shares, and to borrow to the extent of one-fourth. The shares may, with the consent of a special meeting, be divided into preferred and deferred half shares. The water-rate authorized for a domestic supply is six per cent. on the annual rack-rent, or, if not let at rack-rent, on the gross rateable value of the house. If supplied by meter, one shilling and sixpence may be charged per thousand gallons up to a consumption of fifty-thousand gallons; quantities beyond are to be charged one shilling per thousand gallons. The usual extra rates are allowed, and stringent provisions are made for the prevention of waste.

The *Uppingham Water Act* incorporates a new Company, with authority to supply water to Uppingham, in the county of Rutland. The source of the water is to be a well in the parish of Lyddington. The capital of the Company is £6000, and authority is given to borrow £1500. The usual water-rates, and the customary extra charges, are allowed by the Act.

The following Acts confer additional powers on Water Companies already incorporated.

The *Cleveland Water Act* extends the limits of the Cleveland Water Company, and authorizes additional works. Power is given to raise additional capital to the amount of £120,000, the dividend on which is limited as usual, and the ordinary borrowing power is conferred.

The *Newcastle and Gateshead Water-Works Act* authorizes the Water Company to construct extensive additional works. The new capital authorized is £360,000, carrying the usual borrowing powers. The Act empowers the Company to lay a separate system of mains and pipes for the supply of water for trade purposes, and also gives authority to make regulations for the prevention of waste.

The *City of Norwich Water-Works Act* extends the limits of supply of the City of Norwich Water-Works Company, and authorizes them to raise £80,000 additional capital. Six per cent. is the maximum dividend allowed on any capital of the Company. The usual borrowing power is granted. The Directors of the Company may, if they think fit, sell new shares and debenture stock by public auction, any premiums realized being, as usual, deemed capital not entitled to dividend.

The *Plymouth Dock (Devonport) Water Act* confers some additional powers on the Company of Proprietors of the Plymouth Dock Water-Works (who have not been in Parliament since 1797), by extending the limits of supply, and reconstituting the Company. The preamble recites that the Company have raised and expended on works, &c., £104,000 and upwards. In this Act the existing or original capital is said, however, to be £80,000, and this is converted into stock, the dividend on which is limited to seven per cent. Power is given to raise £40,000 additional, entitled to but six per cent. The Company have at present no mortgage debt, so the usual borrowing power is granted in respect of both original and new capital. The usual rates and extra charges are allowed, and all customary powers are granted.

The *Shepton Mallet Water-Works Act* authorizes the Water Company to construct additional works, and for that purpose to raise new capital to the amount of £2800, and to borrow to the usual extent. The Act further confers some ordinary powers of inspection for the prevention of waste.

The *Wakefield Water-Works Act* authorizes the Wakefield Water Company to construct some extensive new works, which were fully described in the evidence before the committee which we have already published. The additional capital authorized is £80,000, entitled to six or seven per cent. according as it is raised. The usual borrowing power is, of course, granted.

The *York New Water-Works Act* authorizes the York New Water Company to construct additional works, and to take a larger quantity of water from the river Ouse, and for this purpose to raise £60,000 of new capital carrying the usual borrowing powers. The dividend on the new capital is limited to six or seven per cent., according as it is raised. After July 1st, 1878, the Company may be compelled to supply water for trade purposes at rates varying from one shilling and sixpence to sixpence per thousand gallons, according to the quantity consumed. The trade supply, however, is not to interfere with the domestic, and the Company are not to be held liable for a failure of the former from frost, drought, or other unavoidable cause. The Act further confers some ordinary powers common in recent legislation.

The following Acts confer various powers on the local authorities who have obtained them. Only those relating to the supply of water and gas will be noticed here.

The *Blackrod Local Board Act* authorizes the Board to construct water-works, and, for the purpose, empowers them to borrow on mortgage £20,000. The water-rates are about those commonly charged, with the usual extras. And seeing that this is a Local Board Act, it need hardly be said that the provisions for the prevention of waste and the recovery of rates are very stringent.

The *Burntisland Burgh Act* extends the limits of the burgh, makes some alterations in its municipal constitution, confirms the Corporation in the possession of water-works already constructed, and authorizes the construction of others. For water purposes the Corporation have power to borrow £25,000. Authority is given to levy a public water-rate of one penny in the pound on the full annual value of rateable property. The domestic and other rates are to be fixed annually on estimates in such a manner that the water undertaking may be self-supporting.

The *Campbeltown Burgh and Harbour Act* authorizes the Corporation to purchase some water-works constructed by the Duke of Argyll, and to make additional works. It also empowers the Corporation to purchase the undertaking of the Campbeltown Gas Company on terms to be mutually agreed upon. The gas to be supplied by the Corporation is to have the illuminating power of twenty candles, and the price is not to exceed 10s. per 1000 cubic feet. The domestic water-rate, as in the Act previously mentioned, is to be fixed on estimates; and the public rate is to be one penny in the pound. The Corporation get power to borrow £18,000 for water, and £12,000 for gas purposes.

The *Edinburgh and District Water-Works Act* (1876) authorizes the Water Trustees to abandon parts of schemes sanctioned by a previous Act, and to construct other works. It also enlarges the limits to be supplied by the Trustees, and empowers them to borrow a further sum of £50,000. There is one provision in this Act which is novel, or, at all events, unusual. It authorizes the Trustees to charge water-rates for a whole year if the premises have been occupied for only part of the year.

The *Dewsbury and Heckmondwike Water Act* is for the most part of purely local interest. It authorizes the construction of some new works at the joint cost of the two local authorities, for which purpose the Corporation of Dewsbury get power to borrow £135,000, and the Heckmondwike Board £45,000. The two authorities have power to levy a public water-rate, not limited in amount, and to collect it in advance. It may be levied prospectively to raise money for future expenses, or retrospectively to cover expenses already incurred. Power is given to the authorities to convert mortgages into a funded debt, which they get power to buy up at *par*, or any price below.

The *Dunfermline Water Act* authorizes the Corporation of Dunfermline to purchase the undertaking of the Water Company, and to construct additional works. The domestic rate is, as usual in Scotland, to be fixed on estimates; deficiencies in any year being made good by an increased assessment in the next. There is also to be a public water-rate levied on a sort of sliding scale. The Corporation obtain power to borrow £70,000 for the purposes of the Act.

The *Galashiels Municipal Extension Police and Water Act* authorizes the Corporation to borrow £50,000 for the construction and maintenance of water-works. The water-rates are to be fixed in the way common to the Acts before mentioned.

The *Huddersfield Water-Works and Improvement Act* is to authorize the Corporation to extend and enlarge their water undertaking. It also extends the limits of the gas supply, fixes the quality of the gas at fourteen candles, and enacts that the maximum price shall be 4s. 6d. er 1000 feet. The Corporation, our readers will remember, have purchased the undertakings of the Huddersfield Gas Company and also the Mold Company; but it would seem that the companies are not yet wound up and dissolved. The Act gives the Corporation power to borrow £400,000 for water purposes.

The *Kirkcaldy Burgh and Harbour Act* extends the limits of, and makes some changes in the constitution of, the Municipality. It also empowers the Corporation to purchase the undertaking of the Kirkcaldy Gaslight Company by agreement, subject to the approval of a ratepayers meeting. When the Corporation get possession of the undertaking, they are required to supply twenty-candle gas, at a price not to exceed 7s. per 1000 feet. All the ordinary powers of a Gas Company are conferred by the Act. [As regards water, the Act only extends the limits of compulsory supply.] The Corporation get power to borrow £10,000 for gas purposes, which may be raised by the issue of annuities or otherwise. In the event of any deficiency of funds for the payment of

interest on the annuities, the Corporation have power to levy a gas guarantee-rate, but no such rate can be levied while the price of gas is less than 7s. per 1000 feet.

The *Lancaster Water and Improvement Act* authorizes the Corporation of Lancaster to extend their works and make some street improvements, empowering them to borrow £75,000 for the purpose.

The *Leigh and Hindley Local Boards Act* authorizes the joint Boards to purchase the scheme of the South Lancashire Water-Works Company, who, in 1871, obtained powers to construct works, but who do not appear to have turned a sod. All the powers conferred by the Company's Act of 1871 are, by this Act, transferred to the joint Boards, with some modifications as regards the works. For the purposes of the Act, the Leigh Board get power to borrow £75,000, and the Hindley Board £50,000. The provisions of the Act are mostly of local interest only.

The *Paisley Water-Works Act* authorizes the Water Commissioners to construct some additional works, and for the purpose to borrow a further sum of £50,000. Some additional powers are granted for the prevention of waste and the collection of rates.

The *Rosstrevor Improvement Act* incorporates a Company who undertake to execute some public works, and to supply water to the town lands of Rosstrevor. The Act authorizes the usual rates, and confers the ordinary powers. The Company are empowered to refuse a supply to a water-closet, if not so constructed as to prevent a flow of foul air into their pipes and mains.

The *Southport Improvement Act*, among other things, authorizes the enterprising Corporation of this borough to extend and enlarge their gas-works, and for that purpose to borrow £230,000. For the future the Corporation have power to charge 4s. 6d. per 1000 feet for gas.

The *Stafford Corporation Act* authorizes the Corporation to construct works for the supply of water to their borough, and some surrounding parishes and townships, the sanitary authorities within these latter having at all times the right to purchase the mains, &c., within their districts. The source of the water is to be a well on Stafford Common. The domestic rate sanctioned is five per cent. on rateable value, with a charge of twenty shillings per annum for one closet, and ten shillings for a bath. Closets more than one, ten shillings each. The Corporation take rather stringent powers of inspection, and obtain authority to undertake the periodical examination of fittings, with the right to charge a fee of sixpence for every article tested and stamped. The Act further authorizes the Corporation to purchase within seven years the undertaking of the Stafford Gas Company, on terms to be agreed upon or settled by arbitration. [The Bill, we may say, was not opposed by the Company, and, therefore, this is not to be regarded as a compulsory purchase.] The consideration is to be a sum in gross or annuities. In the event of purchase, the Corporation are to supply fourteen-candle gas, tested by Sugg's "London" Argand, No. 1. The Corporation take power to borrow £25,000 for water purposes, and any sum that may be required to complete the purchase of the gas undertaking.

The *Stockton and Middlesbrough Corporations Water-Works Act* empowers the joint Corporations to make a compulsory purchase of the undertaking of the Stockton and Middlesbrough Water Company, on terms set forth in another column. It also authorizes the Corporations to construct new works for taking and distributing water from the rivers Balder and Lune. These are to be completed within five years, after which time a constant supply under pressure is to be maintained. The joint Boards take power to charge the same rates as were charged by the Company, with something extra in outside limits. Water for trade purposes is to be supplied for 3d. per 1000 gallons, when the consumption is not less than five millions of gallons per quarter. The Corporations obtain power to borrow as much money as may be required for the purchase of the Company, and a further sum of £700,000 for the purchase of land and the construction of new works. The Act provides for the application of the revenue of the undertaking in the usual way, and enacts that a reserve-fund may be formed if the Corporations think fit; and then, if any balance remain, it is to be divided as follows:—One-third is to be paid to the borough fund of each Corporation, and the remaining third is to be devoted to the reduction of the price of water, charged to consumers of water for domestic purposes.

The *Whitehaven Harbour and Town Improvement Act*, so far as the water supply is concerned, simply gives the Trustees authority to make regulations for the prevention of waste.

MR. HENRY BOWEN.—The Lord Chancellor has recently added the name of Mr. Henry Bowen to the list of magistrates for the borough of Cardiff. Mr. Bowen has for nearly 30 years been engineer and secretary to the Cardiff Gas Company, which office he still holds. He is an alderman of the Town Council, and a few years since was unanimously elected mayor.

Correspondence.

QUALITY AND PRICE OF GAS SANCTIONED BY PROVISIONAL ORDERS.

SIR,—As the time for depositing Provisional Orders for the ensuing session has arrived, it may be of use to some of your subscribers to know the illuminating power and price sanctioned in all the Provisional Orders granted up to the present time. I have, therefore, much pleasure in enclosing you a list. W. LIVESEY.

Gas and Water Companies Association, 6, Victoria Street, Westminster, S.W., Dec. 9, 1876.

List of Gas Provisional Orders granted by the Board of Trade under the Gas and Water Facilities Act, 1870, containing Provisions respecting the "Illuminating Power" and the "Price."

Date	Name of Place.	Illuminating Power, Candles.	Price per 1000 Feet.
1871.—	Bognor	14	6s. 8d.
,,	Hawkhurst	14	6 6
,,	Knutsford	14	4s. 6d. to 6s.
,,	Northampton	—	4s. 6d. to 6s.
,,	North Middlesex	14	5s. 0d.
,,	Pembroke Docks	14	5 6
,,	South Bank, Normanby	14	5 0
,,	Staines	14	5 6
1872.—	Blaenhaven	14	5 0
,,	Bungay	14	5 10
,,	Cleator Moor	14	7 6
,,	East Ardsley	14	7 6
,,	Elstree and Boreham Wood	14	6 0
,,	Ossett	14	—
,,	Portsea Island	14	—
,,	Ruthin	15	5s. to 6s.
,,	Swinton and Mexborough	14	5s. 10d.
,,	Wellington (Salop)	14	6 0
,,	Ystrad	14	—
1873.—	Abersychan	14	6 0
,,	Fleetwood	16	5s. to 6s. 3d.
,,	Ilford	14	6s. 0d.
,,	Leominster	14	5 10
,,	Midsomer Norton	14	7 0
,,	Oakengates and St. George's	14	6 0
,,	Redditch	14	5s. 6d. to 6s.
1874.—	Braintree and Bocking	14	6s. 5d.
,,	Brough and Elloughton District	12	7 6
,,	Chelmsford	14	5 10
,,	Dartford	14	—
,,	Guildford	14	6 6
,,	Harwich	14	7 0
,,	Lofthouse and District	14	7 0
,,	Retford	14	6 0
,,	Romford	14	6s. 4d. and 7s.
,,	Sidmouth	14	8s. 0d.
,,	Sutton-in-Ashfield	14	6s. 6d. and 7s. 6d.
1875.—	Littlehampton	14	6s. 0d.
,,	North Brierley	14	—
1876.—	North Ormsby	14	5 6
,,	St. Ann's-on-the-Sea	14	7 6
,,	Tottenham and Edmonton	14	—
,,	Clacton-on-Sea and District	14	7 6
,,	Chapel-en-le-Frith	14	7 6
,,	Cromer	15	7 6
,,	Hythe and Sandgate	14	—
,,	Poole	14	6 0
,,	Connah's Quay	14	7 0
,,	Flint	14	6 8

N.B.—There have been many other Orders granted for "additional capital," "new works," &c., but not containing any provisions respecting illuminating power or price, these being fixed by former Acts or Orders.

RETORT-SETTINGS.

SIR,—In the report of proceedings of the American Gaslight Association, in your issue of the 28th ult., I find that Mr. Cathels is under the impression that, in cases in which coal is used as retort fuel, "high chimneys are indispensable to create such a draught as will ensure a sufficient quantity of air being drawn through the furnace to burn each of the bodies into which the coal is resolved—viz., the coke, the hydrogen, and the carbon of the gas into carbonic acid in the furnace instead of at the chimney top, *and for like reason a greater furnace-bar area than when coke is used is necessary.*"

As regards the theory set forth in the latter part of the above quotation, I would submit that it is not borne out by facts, as I am now working settings of five retorts, each 9 feet long by 15 inches diameter, in one oven, using coal as fuel, by means of a furnace only 2 feet 8 inches long by 5½ inches wide at bottom, fitted with one 2-inch square fire-bar—deducting which we get an air space of only 112 inches.

In this setting a supply of hot air is delivered in thin streams round the top of the furnace, and the combustion being perfect, the heat thus obtained is intense. For further particulars of this class of furnace, I would refer your readers to the very able paper read at the meeting of the British Association of Gas Managers, 1875, by Mr. John Tindall, the engineer of the Walsall Gas-Works. The theory of this class of furnace is therein very fully explained, and I have great pleasure in bearing my testimony to its entire success in practice.

In this remote part of the country I have not many opportunities of visiting other works; but question if so small a fire-bar area as the above has ever been successfully worked with coke as fuel.

The perusal of Mr. Cathels' paper has afforded me very considerable interest and profit; but on the particular point in question, the *facts* before me are so much at variance with his *theory*, that I feel constrained to submit them for consideration.

I may add that the chimney at these works is 28 feet high by 4 feet square inside, and works seven ovens of five retorts each.

M. J. PARSONS.

Gas-Works, Carnarvon, North Wales, Dec. 2, 1876.

REMOVABLE DIP-PIPES.

SIR,—I am greatly obliged by your insertion of my letter. I was in hopes that the patentees of the removable dip-pipes would not have urged other letters on this subject, but it appears they all have a sick child, and he must be a cruel father that will not protect his own in sickness of this kind. I assure my brother managers the remedy, as stated in my former letter, will keep them in good working order, as it has me since the first application.

In reference to Mr. Copp's remarks, I beg to inform that gentleman that I do not drive near the edge of the precipice, as shown by the following figures:—The hydraulic main being 3 feet wide and 9 feet long and a ¾-inch seal, the surface liquid to deal with I find is, 2916 inches, and the liquid required to seal 7 by 6 inch dip-pipes, 30 inches, is 1116, which leaves 1800 inches in the hydraulic main, sufficient for Mr. Copp and others to repeat the dose again—30 inches more—and leaving 684 inches to spare; so Mr. Copp may drive alongside me with a carriage and pair, without fear of driving over the edge of the precipice. I hope the above will give a sufficient explanation to show that a ¾-inch seal is ample (or even a ½-inch seal), as there is liquor enough in the 30-inch main to seal the 6-inch dip-pipes 60 inches, and a surplus left in the main, much more than I should like to have forced over the arch-pipes into my retorts. This would occur had we the pressure to do it, but with the hydraulic main properly fitted with a safety-valve, or simply an extra dip with the arch-pipe left out, this never would occur. The purifiers are generally the apparatus to let you know if anything is wrong. I find it the best to have a seal entirely independent of any of the apparatus, and seal it 6 inches less than any other part on the works, where you can easily get to it and see it.

In reply to Messrs. Chandler and Sons, I may state that I had thoroughly tested my ¾-inch child on a much larger works than the Carshalton Gas-Works, until I was perfectly satisfied he could run alone, and that I had not forgotten or overlooked any of the principal points at issue, which the above plainly shows. I am surprised at their statement that it requires a main 8 feet wide to seal the 6-inch dip-pipes to stand a pressure of 30 inches, as it makes no difference whether you treat with one bench or 1000, the result is the same. I hope Messrs. Chandler will go carefully through their figures again, and they will find that in this monster main of 8 feet wide there is with a ¾-inch seal 7776 inches of liquor or tar to seal the 6-inch dip-pipes, which will stand a back-pressure of 200 inches and a little over. This would be working on the safe side with a vengeance.

Practical experience for a number of years has convinced me that we should have large hydraulic mains, each bench separate, a ¾-inch seal, and work the exhauster at zero. Probably many will say, "I cannot afford to work a level gauge;" but I say you can better afford this than you can afford to exhaust 1½ inch or 2 inches, and draw in air at every pore, thus impoverishing the gas. As regards the quality of the gas, cannel coal is very expensive, and likely to be, and why should more be used than is really necessary to keep up the illuminating power of the gas to the required standard? If there is no air drawn in with the gas, 5 per cent. of cannel would do more good than 15 with it. Why, then, use it?

I fear the advocates of removable dip-pipes will feel themselves offended in what I have advanced in favour of the hydraulic main *versus* the patent dip-pipes; if so, I hope they will write to me, or (better still) favour me with a visit to our small works. I have only 18 retorts in operation at the present time, producing a little over 100,000 feet per day, but I can show any one how the ¾-inch seal is worked in perfect safety and to great advantage.

Carshalton Gas-Works, Dec. 1, 1876. R. GOOD, Manager.

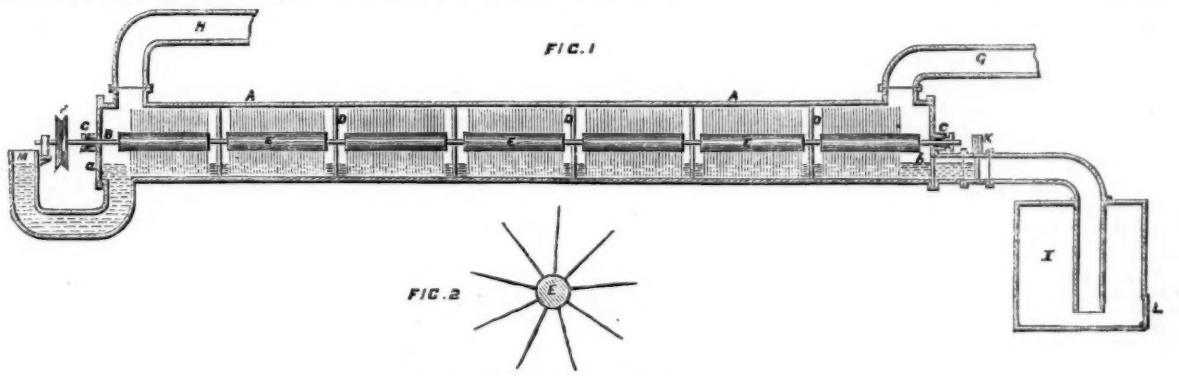
SIR,—I have to thank Messrs. Chandler and Sons for their honourable and courteous reply to my letter, which appeared in your issue of the 21st Nov., and which, although in some measure explaining away the objections raised by me, does not wholly clear up the difficulty created by a sudden back-pressure, which might occur during carbonization, and the subsequent leakage of the retort, which I feel bound to state, at this point of the controversy, is not often likely to happen with such an apparatus as theirs; and I will state why this is the case. Retorts invariably crack after they have been heated, and the longer they are used, the liability to breakage increases; every effort to repair them is attended with considerable uncertainty, and the very fine cracks are of necessity left to fill up by the accumulation of carbon, which cannot take place if an apparatus be used which *wholly* removes the pressure from the retorts. We now arrive at the very strong arguments (which I may call incontrovertible) against the use of any non-self-acting appliance which creates a free passage of the gas from the retorts.

Mr. Copp objects to my laying so much *stress* upon the *unsafe* nature of the anti-dip; but I gave my reasons, and that they are not dealt with argumentatively, instead of being treated with a bare mention of the fact, bespeaks a palpable weakness. That the anti-dip has been used liberally by others is no answer, it is only begging the question to say so. Numerous instances are on record of persons exhibiting a carelessness of risk, which, to say the least of it, points to a want of discretion, and not to an absence of danger. I repeat that, with an exhauster, evil results are produced if a free passage of gas from the retorts be permitted, of which your correspondent, Mr. Grenfel, made a more direct mention. The liability to deteriorate the gas by working at a vacuum is not avoided by the use of the exhausting regulator (or compensator) under such conditions, inasmuch as the regulator does not act until a vacuum be created, no matter how sensitive it may be, and with a slight vacuum the deterioration of the gas at once commences. If the exhauster be worked too slow, the compensator *cannot* act; the vacuum alone, therefore, brings its influence to bear up to a certain point, at which the excessive speed is partially (but not wholly) neutralized.

Birmingham, Nov. 30, 1876. FRANCIS J. W. HAYES.

STILL'S REGISTERED GAS-PURIFIER.

SIR,—In the *Mechanics' Magazine* for June 17, 1848, a drawing is given of a gas "purifier," registered under the "Act for the Protection of Articles of Utility," by Alfred Henry Still, of The Gaslight and Coke Company's Works, Curtain Road, Shoreditch, which is in most respects similar to the washer or scrubber of Mr. G. Anderson, recently described in the JOURNAL, excepting that it is fixed in the horizontal instead of the vertical position. This is another exemplification of the familiar adage that tells us "there is nothing new under the sun." The annexed is a sketch of the "purifier" referred to, with the inventor's description of the same. G. I. P.



STILL'S REGISTERED GAS-PURIFIER.

Fig. 1 is a longitudinal section of this purifier. A A is a cylindrical case, and B a shaft, which runs the whole length of the cylinder, A; it has its bearings in stuffing-boxes which are placed around it, where it passes through the ends, C C, of the cylinder, and also in the upright bars, D, D, D. E, E, E are a set of wooden rollers, affixed on the shaft, B; they are studded with strips of whalebone, or other flexible material, throughout their whole length. A cross-section of one of them is given in fig. 2. The cylinder, A, is filled to the height of the line *a b* with water, or a mixture of lime and water, or any other suitable liquid or solution; the shaft, B, is made to rotate by means of a band from some prime moving power passed over the pulley, F. The gas to be purified is then allowed to escape through the pipe, G, and after passing through the machine it escapes by the pipe, H. When a fresh supply of water, or lime and water, is required, the previous or exhausted charge is allowed to flow into the vessel, I, by means of the valve, K, from which vessel it can be subsequently removed through the door, L. The fresh material is supplied to the cylinder through the pipe, M.

WEST'S MECHANICAL STOKER AT THE RICHMOND (SURREY) GAS-WORKS.—A dinner was given to the *employés* of the Richmond Gas-Works on Friday evening, Dec. 1, to inaugurate the erection and starting of West's patent drawing and charging apparatus at the above works—Mr. Eldridge, the engineer, in the chair. There were also present Mr. Blott, the secretary, and Messrs. West and Hartley, and about 60 men. After a very excellent repast had been partaken of and fully appreciated, and the usual loyal and patriotic toasts given, Mr. Blott proposed that the best thanks of the men be given to the directors, not only for their kindness in providing such a capital dinner, but also for their general liberality and readiness to promote the welfare and comfort of the men in their employ. Mr. Eldridge, in proposing the health of Mr. West, said that from the first he had entertained a very favourable opinion of the "stoker;" and now, after two months trial, he was fully convinced of the utility of the apparatus. Mr. West said he was deeply impressed with the kind expression of approbation which had been accorded him. He, with many others, had striven long to relieve the stokers from part of their arduous duties, and he had always been greatly assisted by Mr. Eldridge and Mr. Hartley, who, from the commencement, had expressed their approval of his apparatus. He felt greatly encouraged by the directors of the Richmond Gas Company giving his machine a fair trial, and he was delighted to see how quickly and easily the stokers had fallen into his system. He did not hesitate to say that the advantages due to the system would soon be found to be as great at Richmond as they had been found to be at Maidstone. Mr. Eldridge proposed the health of Mr. Hartley, the engineer and analyst to West's Gas Improvement Company, who, in responding, said it had become a matter of vital importance to carbonize coal in gas-making in such manner as to produce the largest practicable quantity of gas, consistent with a proper quality, and avoid as far as possible the use of that expensive material cannel. He believed Mr. West had gone very far in the right direction, and that of all apparatus for charging and drawing retorts that gentleman's was the best yet invented. He (Mr. Hartley) had seen several machines tried, and had considered the construction and possibilities of others, but he was of opinion that stoking could never be properly done without a certain amount of direct manual labour. By a judicious arrangement of apparatus, such as Mr. West employed, the work might be very considerably lightened, and in every way much better results be produced. The health of Mr. Eldridge, the engineer, was proposed by Mr. Hartley in appropriate terms and duly responded to. Mr. West then proposed the health of Mr. Blott, the secretary. The head stokers having expressed their satisfaction at the working of the machine, and several other toasts having been given, the meeting terminated, after a very enjoyable evening had been spent.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

WEDNESDAY, DEC. 6.

(*Before the* LORD CHIEF JUSTICE *and Lords Justices* BRAMWELL *and* AMPHLETT.)

METROPOLITAN BOARD OF WORKS *v.* NEW RIVER COMPANY.

The SOLICITOR-GENERAL moved *ex parte*, by way of appeal of the defendant company from an interlocutory order of Justices Blackburn and Quain, of the Queen's Bench Division, who, in an action brought by the Board of Works against the company, in relation to the supply of water for the watering of the Victoria Embankment, and which the former contended should, under the 41st section of the company's Act, be supplied by meter, had upheld the order of a judge at chambers to the effect that as no questions of fact were in issue, the questions at law should be raised in a special case. The learned counsel contended that this was a cumbrous mode of proceeding not contemplated by the Judicature Act, and that the defendants were entitled to have on the record a statement of what the grounds of action really were, so that they could be pleaded to; or if not, that they should be stated on demurrer. In answer to the Court, he admitted that there were no facts in dispute, and that the sole question was one of pure law—whether there was an obligation on the part of the company to supply the board in the way required.

Mr. BIRON, on the other side, relied on the terms of the rule—that the Court, or a judge, if it is made to appear, either on the pleadings or "otherwise," that the question is merely one of law, and that the facts are not in dispute, may direct a special case to be stated; and he urged that it was the course best calculated to save time, though he admitted that in this case there had been some delay.

The SOLICITOR-GENERAL, in reply, urged that the rule only applied when the nature of the case appeared on the pleadings.

The LORD CHIEF JUSTICE considered that this was far too narrow a construction of the rule, and that by its express terms it was competent to the judge to take all the circumstances into consideration which were brought before him in any way and at any time, on an affidavit on the one side or the other, and if satisfied that the question is one of law, he may direct a special case to be stated. This had been done in the present case, and the Court could not interfere with the discretion which had been exercised by a judge, confirmed by a Divisional Court, it being admitted that the question was one of law.

Appeal dismissed.

HUDDERSFIELD COUNTY COURT.—FRIDAY, NOV. 17.

(*Before Mr.* J. W. GIFFARD, *Judge.*)

TRANSFER OF GAS SHARES BY A MINOR.

Mr. B. Earnshaw, a farmer, residing at Shelley, sued the Shelley and Shepley Gas Company for 22s. 6d.—dividend upon three shares in the company—alleged to be due to him.

It appeared that the shares were originally held by Joseph Stevenson Earnshaw, farmer, of Shelley; but, previous to his death, he gave them to Mary Earnshaw, his daughter, then under age. On the 8th of November, 1875, she died intestate, and letters of administration were granted to the plaintiff, her grandfather, who claimed the shares. It then turned out that before her death Mary Earnshaw had transferred the shares to her mother, Elizabeth Earnshaw, and that she had transferred them to George Jackson, one of the executors of Joseph Stevenson Earnshaw. George Jackson afterwards transferred the shares to John Barden, who claimed them as executor of Elizabeth Earnshaw. It was contended, on behalf of the plaintiff, that Mary Earnshaw, being under 21 years of age when she died, had no power to make the transfer of the shares, and that the plaintiff, as her administrator, was entitled to them.

On behalf of the company it was contended that the shares were never legally transferred from Joseph Stevenson Earnshaw, and that his executors were the persons who were entitled to them.

The JUDGE decided that it had been clearly proved that the shares had been given to Mary Earnshaw, and that she, being under age, had no power to transfer them, and, dying intestate, they belonged to her administrator. He therefore gave judgment for the plaintiff, with costs.

SWANSEA POLICE COURT.—MONDAY, DEC. 4.

(*Before the* MAYOR, *the* STIPENDIARY *and Mr.* J. ROGERS.)

REFUSAL TO SUPPLY GAS WITHOUT A DEPOSIT.

PRUST *v.* THE SWANSEA GASLIGHT COMPANY.

This was a summons taken out by the plaintiff, Mr. John Prust, shipbroker, New Exchange Buildings, against the defendants, for refusing to supply gas to his offices without a deposit. The plaintiff conducted his own case; the defendants were represented by Mr. LAWRENCE.

Mr. John Prust, the plaintiff, said: I am a shipbroker, carrying on business at the Exchange Buildings. On the 6th of November I received from the gas company a letter which I produce. This was previous to my occupying the premises. The letter runs: "Dear Sir,—As the gas is about to be supplied to the Exchange, we shall feel obliged for the usual deposit." The deposit was 20s. I saw the owner of the premises, Mr. Thomas White, and he told me he was called upon by the gas company to pay a deposit to cover the whole of the buildings. I have subpœnaed him, and he is now present. In consequence of what he told me, I took no notice of that letter. I occupied the premises, and gas was supplied. Some days after I had been consuming gas, a letter was received from the gas company stating that unless I complied with the rules of company, and paid the deposit before 10 o'clock on a certain day, they would cut off the supply. I had then been supplied with gas for nearly a fortnight. There was no communication between these two letters. I refused to pay the deposit, and wrote that the letter they had sent me was rude, and only what might have been expected from such a source.

The STIPENDIARY: You gave them a "retort," Mr. Prust?

Plaintiff: Well, I think it was time. On the 17th ult. a man came to my place, and said he had been sent by Mr. Thornton Andrews to take away the meter. I ordered the man off my premises, and would not let him cut off the gas. I then received this letter: "Sir,—My fitter informs me that you decline to allow him to remove the meter. Are you desirous of burning gas? If so, you should pay the deposit demanded at once to the company's offices. If you obstruct our fitter, a summons will be taken out against you in the Swansea Police Court, in accordance with the company's Act." The man came again, and said he was authorized to use "gentle force" to take away the meter. I found that "gentle force" was not sufficient to remove the fitter from my premises, and so I sent for a policeman. I heard nothing more about the police court summons. On the same day I wrote a letter to Mr. Andrews, stating that I had already paid two deposits for a house and my offices, and that I would resist the payment of a third. I said that if the company could legally compel me, then, of course, I must pay it, but not until then. I also said, "I am quite prepared to meet you in the Swansea Police Court."

In answer to questions from the Bench,

Plaintiff said: I occupy simply an office in the New Exchange Buildings. I paid a deposit 15 years ago for the premises I previously occupied. I have only changed offices. The gas with which I have been supplied passes through Mr. White's meter. Mine is a check meter. The gas to supply the whole building passes through Mr. White's large meter.

Mr. ROGERS: Who paid for the pipes which are between the large meter and your meter?

Mr. THORNTON ANDREWS (secretary to the gas company): Mr. White.

Plaintiff: On the 21st of November, when I went to light the gas in the office, I found that it was cut off underneath. I wrote to the gas company stating that I demanded to be supplied with gas forthwith.

The STIPENDIARY: And did seven days elapse before you took out proceedings in this court?

Plaintiff: Yes.

Mr. LAWRENCE put in an agreement with a printed notice on the back, and contended that the company were authorized to demand that consumers should pay a quarter's gas-rent in advance, irrespective of deposit in hand. Plaintiff had signed that agreement, and it had been stamped. It was also stated on authority of the company that plaintiff had not paid a deposit for the office he had previously occupied. The bills were always charged to "Richard Prust and Sons," the old firm with which the plaintiff had been connected before he set up for himself, and not to John Prust.

Plaintiff, on the other hand, stated that he had paid the deposit fifteen years ago, five years before he took his father and brother into partnership. He had also paid a deposit seven years ago for his house. This, however, was denied.

In answer to further questions, plaintiff said he thought he had read all the applications that had been made to him to pay a deposit for his new offices. He answered them all before the man was sent to cut off his meter. The last letter was dated the same day that the man was there.

Mr. LAWRENCE: Have all the tenants at the Exchange been called upon to pay?

Plaintiff: I know of my own knowledge that some have not paid.

Mr. LAWRENCE: Do you know that they have not been required to so so?

The STIPENDIARY: That is not evidence.

Plaintiff admitted that he had signed the stamped agreement which had been put in. It had been brought to him by Mr. Nott, his plumber, but he had not read the notice on the back of it. It had not been pointed out to him.

Mr. LAWRENCE: Nott is not a servant of the company.

Mr. *Thornton Andrews*, secretary of the company, was called, and in reply to inquiries by the plaintiff, said: I have been applied to by Mr. Thomas White verbally several times to supply the Exchange Buildings with gas, more particularly on the 25th of October. The application was verbal, and was answered by letter. The letter stated that the gas company's inspector had seen the buildings, and found the cellars flooded with water. It would be necessary to have a dry place for the meter. The inspector would meet Mr. White and make arrangements. Mr. White was also told that he must pay a deposit of £20 before the work could be done. A notice was sent to him to that effect. He paid the amount, and this is the receipt, dated Oct. 31, 1876, as a deposit for work done, as stated in the letter.

Mr. ROGERS: What was the deposit for?

Mr. *Andrews:* It was a deposit for laying the pipes and supplying the meters in accordance with the terms of the Act, not for gas. The Act prescribes that the consumer shall, on demand by the company, pay a deposit as security for the pipes and meters, if required to do so. But this Exchange is an exceptional case altogether, and I shall give a description of it.

The STIPENDIARY: What clause do you refer to?

Mr. *Andrews:* The 14th section of the Gas-Works Clauses Act, 1871, which is incorporated with the Swansea Gas Act.

The STIPENDIARY: It is doubtful to me whether the Act of 1871 is retrospective or only prospective in its operation.

Mr. *Andrews:* It has been decided that it is retrospective in the case of companies previously incorporating the Gas-Works Clauses Act, 1847. [Witness read the two last lines of sec. 51 of the Act of 1861, referring to payment in advance for three years.] Such security may be "by way of deposit or otherwise."

Plaintiff: Now, upon the deposit being paid by Mr. White, did you supply the Exchange with gas?

Mr. *Andrews:* We laid the necessary pipes, and supplied him with gas.

Plaintiff: The whole of the building?

Mr. *Andrews:* Yes.

Plaintiff: Then, in supplying the Exchange Buildings, you supplied the offices?

Mr. *Andrews:* Not necessarily so.

Plaintiff: And allowed me to consume gas for several days?

Mr. *Andrews:* Unknowingly. You ought to have complied with the demand before you commenced burning. You had your meter connected by your own fitter.

Mr. ROGERS: Whose were the pipes leading to the plaintiff's meter?

Mr. *Andrews:* They belong to Mr. White, of the Exchange Buildings.

The MAYOR: The pipes you cut off?

Mr. *Andrews:* The pipes we disconnected. The meter is the property of the company, and is let on hire.

Plaintiff: Is there any necessity for me to have a meter at all in my offices before gas can be supplied?

Mr. *Andrews:* Certainly.

Plaintiff: Is it a check meter?

Mr. *Andrews:* No; it is a check meter as far as your own consumption is concerned. We charge you separately—not Thomas White.

Mr. ROGERS: How many such meters are there in the building?

Mr. *Andrews:* Sixty or seventy.

Mr. ROGERS: And any discrepancy between the amount registered by the large and the small meters is paid for by Mr. White?

Mr. *Andrews:* Exactly.

Mr. ROGERS: According to the arrangements he might make with the consumers?

The MAYOR: He is in the position of a contractor, then?

Mr. *Andrews:* He is not, sir.

The MAYOR: You say he is responsible for the leakage?

Mr. *Andrews:* He is responsible for the difference between the larger and the smaller meters.

Mr. ROGERS: So that if Mr. Prust chose to leave the office without paying, Mr. White would be responsible for it?

Mr. *Andrews:* That I cannot answer. I do not know whether he would be willing to pay for Mr. Prust's gas or not. Leakage or discrepancy between the meters would be paid for by Mr. White.

Plaintiff: Did Mr. White consent to become security for the whole of the gas consumed on the premises?

Mr. *Andrews:* No.

Plaintiff: Are there any other cases at the Exchange where you have applied to persons for this deposit?

Mr. *Andrews:* Deposit or security in the way of guarantee.

Plaintiff: And do you always get it?

Mr. *Andrews:* Yes, invariably. There may be a few exceptions—churches and chapels, or such things.

Plaintiff: Are there any exceptions at the Exchange Buildings?

Mr. *Andrews:* Not with consumers supplied by Mr. White's meter. Every person supplied through Mr. White's meter has been applied to for a deposit.

Plaintiff: But there are some, not supplied by Mr. White's meter, who have not paid?

Mr. *Andrews:* "Some" is not correct. There is one, who has his own meter, who has not paid a deposit.

Mr. ROGERS: Is not that a case where you should ask for a deposit?

Mr. *Andrews*: We have exercised our discretion. He has satisfied the company.

In reply to Mr LAWRENCE, Mr. *Andrews* stated that the receipt for the £20 deposit paid by White must be read in conjunction with the letter that led up to it. The deposit covered some expensive structural work in laying pipes, &c.

Mr. *Thomas White* was then called. He stated that he had paid the deposit of £20, and was under the impression that it was a deposit for the supply of gas. He had also understood that he was responsible for the whole.

Mr. *Andrews* said that was not so. The company would not have accepted Mr. White as responsible for the whole of the gas burnt there.

After some questions put by the BENCH, *Plaintiff* said this was his case.

On the other side,

Mr. *Andrews*, examined by Mr. LAWRENCE, stated that it was the invariable practice of the company to ask for a deposit for offices distinct from private houses. In this case of the exchange, all the consumers had been treated in the same way. He had no personal feeling to make him act differently towards the plaintiff. The company had not accepted Mr. White as guarantor for the other consumers. No such proposition was made, and if it had been it would have been declined.

The STIPENDIARY said this was a case involving considerable difficulty, and the Bench would therefore adjourn their decision.

THURSDAY, DEC. 7.

The STIPENDIARY, in giving judgment in this case, said: This is a summons in which the Swansea Gas Company are charged with illegally refusing to supply Mr. Prust with gas, in his office in the New Exchange. It appears in evidence that Mr. Prust, having removed from another office to the Exchange, obtained a service-pipe and meter for his new office, and signed the following stamped contract:—"I hereby agree to burn and to pay for all gas consumed or registered on my premises, situate at No. 5, Royal Exchange, and request that you will lay on the necessary service-pipes and supply me with a 2-light meter, for which I agree to pay in accordance with the rules and regulations in force for the time being." On the back of the contract are printed rules, to which attention is specially called. Rule 8 is as follows:—"The gas company require the consumer to pay a deposit equal to a quarter's gas-rent in advance, before commencing to consume gas, and such deposit is kept in hand for three years." Mr Prust refused to pay the deposit, and the supply of gas was cut off. The question is whether the company are justified in taking that step. It was argued that a deposit of £20, which had been made by the owner of the whole building, covered any claim for deposits from the occupiers of separate offices. I think that is not the case. An outlay amounting to £42 was made by the company for the benefit of the owner, as shown by the bill produced. In a letter of the 25th of October, from the company to the owner, they say, "Please fill up the enclosed form and return to us, together with a deposit of £20, before the work can be done." This makes it clear to my mind that the £20 was only meant to be a security from the owner and not from the occupier; that the Act of 1871 is to be read with the Swansea Act, and by section 16 such security may be by way of deposit, and of such amount as the parties shall agree upon, or, in default of agreement, may be determined by two justices, &c. When the deposit of 20s. was required, Mr. Prust might have proposed to discuss the proposal, and, failing an arrangement, might have referred the matter to two magistrates. But on the 17th of November Mr. Prust wrote to say, "Having paid two deposits, I am determined to resist payment of a third." In this case, therefore, there could be no discussion or reference to justices. Mr. Prust seems to have thought that a deposit he had paid years before for other premises would be valid for the new office. That proposition cannot be maintained. The company, finding that Mr. Prust did not comply with the demand, after the lapse of many days, stopped the supply of gas, and contend that, in so doing, they are not liable to any penalty. We think that, in view of his contract, Mr. Prust has acted under a mistaken impression of his rights. We dismiss the summons, but without costs. We may add that it would be advisable to have all the important parts of a printed form placed on the front, and not on the back of the paper supplied to consumers. We also hope that an amicable arrangement will now be made, which will be satisfactory to both parties.

The MAYOR said the only point that convinced him of Mr. Prust's liability was the fact that he had signed the stamped agreement.

Plaintiff inquired whether he was obliged to become a tenant of the gas company, or whether he had the option of getting his gas supply through Mr. Thomas White, the owner of the Exchange.

The STIPENDIARY said that must be a matter of arrangement between Mr. Prust and the company.

Plaintiff asked his worship's opinion respecting the 15th clause of the Gas-Works Clauses Act, 1871, relating to the 24 hours notice required before connecting or disconnecting a meter.

The STIPENDIARY declined to give an opinion from the bench without fully considering the words of the section. His worship also added that he hoped Mr. Andrews and Mr. Prust would come to an amicable arrangement, and that Mr. Prust would not be left in the dark.

Mr. *Andrews:* Certainly, sir; I have been willing from the first to arrange amicably, but Mr. Prust has adopted such a defiant tone that we could not.

Mr. LAWRENCE said he was instructed to apply for the return of the meter.

The STIPENDIARY: I strongly recommend that an amicable settlement should be made.

Plaintiff: It is not a private question, your worship, but a public nuisance.

The STIPENDIARY: That remark will not tend to an amicable settlement.

The parties then withdrew.

CROMER GAS COMPANY, LIMITED.—The annual general meeting was held on the 22nd ult.—Mr. J. B. Cabbell in the chair. The report stated that the works are now complete and in full operation; and there is a considerable increase in the number of consumers, so that there is every probability of reporting further progress at the next annual meeting. The works have only been in operation nine months, and commenced with nine customers. Now there are forty-four customers, and several applications from occupiers and owners of houses to be supplied with gas. The earnings of the company for the quarter ending October 11th were £146 17s. 11d. There was a small balance after paying all expenses, but not sufficient to declare a dividend. The report was adopted, and thanks were voted to Mr. Fitt, the managing director, for his services.

KEIGHLEY NEW GAS-WORKS.—The *Leeds Mercury* reports the opening of these works on Tuesday, the 5th inst., by Mr. B. S. Brigg, the chairman of the local board to whom they belong. The new works were rendered necessary by the rapidly-increasing consumption of gas, and the fact that the Great Northern Railway Company, for the purposes of their projected station at Keighley, purchased from the board the only available ground on which the old works could be extended. The site of the new works at Thwaites, on the low side of the Midland line, from which a siding has been secured, is admirably adapted for the purpose. The manufacturing power is one million cubic feet per day; but the works have been so laid out that, when necessity arises in the future, the works can be extended to triple their present size. They are now of the most ample dimensions, and, so far as the use of the best appliances and arrangement of details are concerned, are of the most perfect character. The cost of the works is about £40,000.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health, on the composition and quality of the metropolitan waters in November, 1876:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen. — As Nitrates, &c.	Ammonia. — Saline.	Ammonia. — Organic	Hardness (Clark's Scale). — Before Boiling.	Hardness (Clark's Scale). — After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	20·312	0·048	0·120	0·000	0·007	14·3	4·2
West Middlesex	19·840	0·048	0·165	0·001	0·006	14·3	3·3
Southwark and Vauxhall	20·422	0·058	0·120	0·001	0·008	14·8	3·7
Chelsea	20·802	0·039	0·165	0·000	0·006	14·3	2·8
Lambeth	21·602	0·038	0·180	0·001	0·005	14·8	4·2
Other Companies.							
Kent	26·122	0·014	0·300	0·000	0·002	15·8	5·1
New River	19·314	0·014	0·165	0·001	0·004	14·8	2·0
East London	22·010	0·031	0·120	0·000	0·004	15·9	3·3

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

C. MEYMOTT TIDY, M.B.

UNCLEAN WATER-CISTERNS AT THE MANSION HOUSE.—At the Court of Common Council on Thursday last, the chairman of the General Purposes Committee, in asking for a grant to make good certain dilapidations at the official residence of the Lord Mayor, took occasion to remark that, at a recent examination of the domestic arrangements there, the committee found three-quarters of an inch of fungi-scrub floating on the top of the largest cistern in the Mansion House, and which supplied all the other cisterns used for domestic purposes in the establishment. Moreover, at the bottom of the same cistern there were three-eighths of an inch of mud, and in a bottle of water placed on the Lord Mayor's table could be seen hundreds of nematoid worms. In that state of things, and from a deep feeling of anxiety to make the Mansion House as habitable as possible, his committee applied to the court for, and received from them, £200 more than had been granted for a similar purpose in any previous year. Mr. Moore, continuing his relation of the circumstances, reminded the court that in the previous mayoralty a daughter of the then Lord Mayor was for a considerable time hovering between life and death from a malignant form of typhoid fever. Other members of his family were also affected, and all their ailments appeared to be referable to a malarious origin. Dr. Sedgwick Saunders, medical officer for the City, having been consulted at that time on the subject, was of opinion with the medical gentleman attending the family that the illness in the house was directly occasioned by the condition of a soil-pipe intersecting the whole house, and its connexion with the water-cistern.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The next Ordinary Half-Yearly Meeting of this Company will be held at the Offices, Sumner Street, Southwark, on Thursday next, when the following Report of the Directors will be submitted:—

"The directors beg herewith to submit to the proprietors the half-yearly statement of accounts of the company to Sept. 30, 1876. They do so with satisfaction, as it places before them clearly the true position of the company, and the amount available for dividends. Every bill and liability, to the best of their belief, has been either paid or placed to the debit of the account. With the confident hope that, by the continuation of their exertions, and the unwearied activity, skill, and general knowledge of their new engineer, supported by the secretary and other officers, they will restore the company, at no distant period, to commercial success.

"On the 18th of October Mr. Stoneham, the Government auditor, went into the question, and settled the allocation between capital and revenue, of the accounts of Messrs. Harvey and Co. The directors refer you to his letter of the 18th of October, and to the circular-letter of the chairman issued on the 24th of October, hereto annexed.

"The prosperity of the company greatly depends on diminishing expenditure; by strict supervision and open contracts for the company's works and requirements, the directors hope to attain this desirable end. Already, in the supply of meters, pipes, and valves, a very considerable saving has been effected.

"The directors are pleased to be able to inform you that they have secured the services of the eminent engineer, Mr. F. J. Bateman, F.R.S., to undertake the duty of reporting upon the efficiency of the extension works at Peckham, constructed from the designs, and under the superintendence, of the late engineer to the company.

"The Vestry of Richmond having determined to erect works for an independent water supply, obtained a money grant from the Local Government Board for the purpose of constructing corporation works to supply their district with water. The parliamentary powers of this company not extending so far, and the legal decision being adverse to the claims of this company, the directors will carefully guard the interest of the shareholders in any arrangements that may be necessary.

"On the 21st of July the board proceeded to the election of a chief engineer, having received applications and testimonials from 35 gentlemen to fill the vacancy. The board were fully alive to the responsibility and great importance of this appointment, and considered that the gentleman selected should be an eminent engineer, of ready resources in case of accident, acquainted with the best market for pipes and materials, with a knowledge of coal, with a firm yet conciliatory manner in dealing with our 80,000 tenants and the numerous persons with whom he is brought in contact, a good organizer, and of unimpeachable integrity. With these points in view they selected T. W. Rumble, Esq., who has now filled the office, to their great satisfaction, for a period of five months. The directors refer to the chief engineer's report (copy herewith) for detailed particulars of the working of the company.

"In filling up the vacancies at the board, caused by the retirement of Mr. Arthur Clay and Mr. Frederick Wigan, your directors have been guided solely and entirely by what they believe to be for the best interests of the company. They have appointed as directors Mr. Henry Edmund Knight, Alderman, a gentleman residing close to our works at Hampton. From his position, standing, and knowledge of business, he cannot fail to be an acquisition to the board. Also Mr. John Hodges, an old shareholder, and constant attendant at our general meetings, who has shown the deep interest he takes in the well-being of the company. These appointments the directors trust will be acceptable to the shareholders.

"Three directors—Mr. C. M. Vialls, Mr. Henry Whiting, and Mr. George Tyrrell—retire by rotation, and, being eligible, offer themselves for re-election.

"The directors recommend that a half-year's dividend at the rate of £4 10s. per cent. per annum on the ordinary stock and class D shares, and 5 per cent. on the preference stock and preference shares, and £4 10s. per cent. per

annum on the new ordinary No. 1 shares, be declared, payable on the 15th day of January, 1877.

"To simplify the stock and share accounts of the company, and for greater convenience of registration, the directors recommend that 590 fully paid-up (£100) new ordinary shares of the company be converted into the existing ordinary stock, and a resolution to that effect will be submitted to you at the meeting, in accordance with the powers and provisions of the Companies Clauses Consolidation Act of 1845, in their behalf.

"Your directors are unwilling to close their report without bearing testimony to the very hearty co-operation now existing between the members of the board, and their united determination to exert themselves to the utmost to produce good dividends, efficient supply, and a thorough maintenance of the works at the minimum cost of expenditure."

Accompanying the report is circulated the letter of Mr. Stoneham, the Government auditor, on the subject referred to in the second paragraph:—

"*Local Government Board, Whitehall, S.W., Oct.* 18, 1876.

"Sir,—In reply to your letter of the 4th of August last, I have to request that you will have the goodness to invite the consideration of the directors of the Southwark and Vauxhall Water-Works Company to the subjoined remarks.

"When the accounts were first placed in my hands in June last, they bore no evidence of any examination (1) as to the accuracy of the charges made; (2) as to the delivery of the work; (3) as to the allocation of the charges, as between capital and revenue.

"The accounts were afterwards returned to Mr. Quick, at the request of the late chairman (Mr. Arthur Clay), for his report as to the charges.

"A superficial examination of the accounts, when returned to me, was sufficient to show that the late engineer, in making his allocations, had not been guided by any fixed principles, and I was, therefore, obliged to refuse to accept the figures as presented to me.

"On the resignation of Mr. Quick, I was compelled to defer any further investigation until Mr. Rumble, the newly-appointed engineer, had made himself acquainted with the works.

"Mr. Rumble informs me that, having considered the charges made by Messrs. Harvey and Co., and having regard to the nature of the work, and the period which has elapsed since its completion, it is not now possible to make the allocation with accuracy. I am consequently obliged to decide upon such evidence as I can obtain.

"Assuming, then, for the purpose of distributing the charges, that the claims are correctly made, I find the account of Messrs. Harvey to stand as under:—

Balance due in 1867	£6,865	2	8
Charges since that date	92,856	8	5
	£99,721	11	1
Payments on certificates of Mr. Quick . .	89,000	0	0
Amount due	£10,721	11	1

"Having myself gone carefully through the works of your company, and having carefully discussed the matter under consideration with the engineer and chairman, I have come to the conclusion, after very anxious and careful consideration, that substantial justice will be done if capital be relieved of the sum of £33,002 8s. 8d., it being understood that the balance of £10,721 11s. 1d., above alluded to, is also to be made a charge against revenue.

"The above arrangement will, of course, be subject to modification if a further investigation of the accounts by your board should lead to a diminution in the total of Messrs. Harvey's claim.

"In the course of my inquiries, Mr. Quick informed me that the practice of overcharging capital on the certificates of the engineer had been followed for many years past, and having regard to the greatly increased charge which will in future be borne by the income of the company, I think it not unreasonable to acquiesce in an arrangement by which the charges under consideration may be treated as a newly discovered liability, and spread over a period of, say, five years. If, however, it is found that the expenditure requisite to put the filter-beds in efficient working order proves to be as heavy as your board anticipates, it may be necessary to reconsider the arrangement. I am not without hope that this course will not be necessary, as there is good reason to believe, from the investigations already made by your board, that a considerable increase of the rental may be obtained without unduly pressing on the water consumer; but it should be borne in mind that the facility with which re-arrangements of the charges can be carried out will necessarily greatly depend on the quality of the water supplied.

"In conclusion, I think it my duty to again call attention to the large sum of money which has been charged for interest, under the statutory powers of the company, to capital on the expenses incurred for the purpose of giving constant supply. I am informed that the works constructed under those powers have not yet been brought into use. It is for the board of directors to consider in how far they are justified in availing themselves of advantages of this nature without, on the other hand, giving effect within a given period to the implied undertaking on which the exceptional privilege was granted.

(Signed) "ALLEN STONEHAM.

"To the Secretary, Southwark and Vauxhall Water-Works Company."

Also the letter addressed to the shareholders in October last by the present chairman (Mr. Whiting):—

"*Sumner Street, Southwark, S.E., Oct.* 24, 1876.

"Dear Sir,—It is within your recollection that, at a general meeting of the shareholders on the 8th of June, it was resolved that the same should be adjourned until the 22nd, for the purpose of receiving Mr. Stoneham's report upon the allocation of Messrs. Harvey and Co.'s accounts.

"At the adjourned meeting, on the 22nd of June, the directors were in no better position; but they then pledged themselves that the shareholders should have the earliest intimation of the result of Mr. Stoneham's investigation.

"Mr. Stoneham's allocation has now been received, and it is dated the '18th of October, 1876.' Hence you will see no time has been lost.

"Since the meeting of the shareholders, the directors have had this matter under their serious and anxious consideration, as also the position of the company, and have resolved themselves, as it were, into a committee of investigation, the report of which, they feel sure, will be received by the shareholders with considerable satisfaction at the next general meeting.

"The result of Mr. Stoneham's deliberation, aided by the anxious endeavours of the board, has been, that 'substantial justice will be done if capital be relieved of the sum of £33,002 8s. 8d., and the balance £10,721 11s. 1d., due to Messrs. Harvey and Co., made a charge against revenue.'

"Taking into consideration the active measures of the board in order to put the supply upon an efficient footing, Mr. Stoneham has consented to treat these sums as a 'newly discovered liability,' and spread the amount over a minimum period of five years, giving your directors the opportunity, if circumstances should require, to reopen the matter for the purpose of getting a further extension of time, in order that the dividends may not be affected.

"Such consideration on the part of the Government auditor will doubtless be appreciated, and shows you the present activity is not without its marked effect.

"The directors intend that the report to be issued for the approaching general meeting, in December, shall be in the hands of the shareholders fourteen days before the said meeting, provided Mr. Stoneham has audited and certified the accounts.

"The directors trust the introduction of two gentlemen to fill the vacancies on the board, caused by the resignation of Messrs. Clay and Wigan, and the appointment of a most efficient engineer (Mr. T. W. Rumble, C.E.) in place of Messrs. Quick and Son; the complete reorganization of the engineering staff, together with such reforms in the other departments, will re-assure those interested in the company that all is now being done to place the undertaking upon a sound commercial footing.

(Signed) "HENRY WHITING, Chairman."

The following report of the new engineer, Mr. Thomas W. Rumble, will be read with general interest:—

"*To the Chairman and Directors of the Southwark and Vauxhall Water Company.*

Engineer's Office, Sumner Street, Southwark, Nov. 30, 1876.

"Mr. Chairman and Gentlemen,—Acting upon your instructions, I have now the honour to lay before you a report for the information of the shareholders. Your board deputed to me the conduct of its engineering department on the 21st of last July, from which time great activity has been displayed, under your instructions, with a view to placing the establishment, works, and service upon an efficient footing. During the summer months, very heavy calls were made upon the resources of the water supply of the company, but by a revision of the distribution the difficulty was met in such a manner that complaints have steadily declined, and those now made result chiefly from defective fittings.

"In order to define more clearly the present position of the company, and the result of the examinations hitherto made, a general outline of its history may not be without interest to the shareholders.

"Southwark was formerly supplied with water from a pond at St. Mary Overies; and also by two wheels belonging to the London Bridge Works, erected in the fifth arch from the north and second from the south, under a lease granted by the City in 1767. At the period when the building of a new bridge was contemplated, a removal of the water-wheels became inevitable, and, in addition, both establishments were in a very inefficient state, their pipes running along the same streets, and in competition, so as to interfere greatly with each other.

"The borough works at St. Mary Overies, in 1820, became the property of one J. Edwards, who, in 1822, also purchased from the New River Company the works on the south side of London Bridge, and combined both concerns under the designation of the 'Southwark Water-Works.' The whole being thus possessed by one opulent individual, he caused two steam-engines to be erected (one 36-horse power, and another 18-horse power). Prior to this, wooden pipes only were used, which were gradually taken up, and iron pipes of larger diameter substituted, varying in size from 3 inches to 16 inches. A further important alteration was made by adopting a new method of taking water from the Thames; for, instead of obtaining it near the shore, a large iron main was carried along the bottom to the middle of the river—where the substratum was gravelly—the mouth of the conduit for conveying it to the wells of the steam-engine being also covered with an iron semi-sphere perforated with a great number of small holes. At this time, there being no reservoirs, the water was pumped into a cistern some 60 feet high, 'adapted' to contain from 300 to 400 barrels of water, whence it flowed to the houses, some receiving it as high as 42 feet. The two engines were competent to raise 4 million gallons in 24 hours.

"In the original construction, and subsequent improvement of these works, more than £70,000 was expended, and they supplied about 7000 houses daily with about 1,500,000 gallons of water. The high service extended in various directions to about 800 houses in the district, some of these houses being two miles distant from the engines.

"In 1805 several persons united to give effect to a scheme for organizing the South London Water-Works (subsequently called the Vauxhall), and by an Act of Parliament passed in July, 1805, they were incorporated as a company, with authority to raise capital for attaining their object, amounting to £80,000, in 800 shares of £100 each. In the first instance only £90 was paid upon each share, but exclusive of the money so raised, instead of paying an annual dividend to the shareholders, the whole of the income that exceeded the expenses, was for several years applied to the improvement and extension works. Though by pursuing this course, the capital employed became considerably augmented, it still proved inadequate to the full accomplishment of its object; and therefore another Act was obtained in June, 1813, for empowering the company to raise a further sum of £80,000. This authority led to the creation of 150 additional shares of £100 each; but different causes afterward involved the company in pecuniary difficulties, and their exigencies compelled them, in 1823, to issue exchequer bills to the amount of £7000. At the time this loan was obtained, the nominal capital was stated to be £95,000. Then came the creation of 50 more shares, making an aggregate of £100,000, but according to statements made before Parliament in 1828, the money actually expended upon works had then amounted to the sum of £184,394 2s. 7d. Other improvements occasioned the outlay of further large sums, and great as was the whole cost to the proprietors, and beneficial as their enterprise proved to the district, they nevertheless received, from the time of their incorporation, in 1805, until 1834, no other pecuniary benefit than the small sum of £24 in dividends. The operations of this company commenced inauspiciously for their interests, by reason of their having originally adopted wooden pipes, and having then been compelled to substitute iron in their place. The principal works were on the south side of Kennington Lane, formerly Kennington Common, near to Vauxhall. At first, use was made of two small steam-engines, but the united powers of both proved so incompetent to the office imposed upon them, that it became necessary in 1822 to remove them, when one engine (45-horse power) was erected, which pumped water to a height of 45 feet above the level of the reservoirs. Since that period another 20-horse power engine, with a pump of 16 inch diameter, was erected at Cumberland Gardens, adjoining Vauxhall Bridge, for the purposes of propelling water from the Thames into the reservoir in Kennington Lane. The well of the latter engine was supplied by means of an iron tunnel, 42 inch diameter, extending into the river, as far as the third arch of Vauxhall Bridge, where it terminated at a depth of 6 feet below the lowest water-mark. Though a part of the water was thus conveyed to the works, yet another portion passed to them up the channel of the Vauxhall Creek, but in order to stop any communication with this channel, the company laid down, in 1832, a range of large iron pipes, 4 feet diameter, for the purpose of connecting their several reservoirs with the River Thames; and at this time the conduit in question probably exceeded in dimensions every other hitherto employed for similar purposes in the Metropolis. In some parts these pipes were placed 24 feet below the surface, and their average depth was about 12 feet. It was an important circumstance in favour of this company that it drew its source from the Thames, near to Vauxhall Bridge, since the water of the river was at that time generally pure and bright, while the abundance thence obtained enabled the company to furnish an ample supply wherever their operations extended.

"In Kennington Lane the company possessed about five acres of land, upon which two circular reservoirs were constructed of about 145 feet diameter, one of which had a more elevated bank than the other. The depths varied, the higher one being 15 feet 6 inches, and the other lower 12 feet deep. Both were lined with brick, and the bottom gradually sloped from the circumference to the centre.

"During the spring tides the water flowed from the Thames into the reservoirs, and filled them to the height of 9 feet; but by the assistance of the engines, they were also completely filled as occasion required. When quite full the deepest alone contained about 2 million gallons, and this was more than sufficient for the daily supply of the district.

"Amongst the improvements at this date should be enumerated the construction of a new reservoir in Kennington Lane, to receive the water as it flowed from the Thames through the iron tunnel before described. From this reservoir the water percolated through a filtering bank, composed of layers of coarse and fine gravel and sand, prior to its entering into another settling reservoir, where it remained for some time before passing to the well of the engine for distribution. The various reservoirs contained about 6 million gallons in 1835. The supply of this company extended to more than 10,000 houses in a populous district, comprising the parishes of Lambeth, Newington, Bermondsey, Rotherhithe, Deptford, Camberwell, and Clapham.

"Thus it will be evident that these companies experienced various vicissitudes in their progress, until, in 1845, when an amalgamation took place under an Act of Parliament, to which we owe the creation of the Southwark and Vauxhall Water Company as it now exists.

"The area of the district supplied extends for about 13 miles east and west, and 3 miles north and south; the home district stretching from Rotherhithe to Clapham, and the suburban and rural districts from Wandsworth to Richmond. Thus an area of 39 miles south of the Thames receives a supply of water, distributed to about 80,000 houses, having a population of 550,000.

"For the purposes of collection, this area is divided at present into 10 districts, having a collector for each. They are paid entirely by commission, exclusive of the meter-rates, to which an office collector attends, and is paid by salary.

"The following is a synopsis of the company's property at the present time:—

"One pumping-station at Battersea, standing on freehold land of some 50 acres, and six engines, with a total of 1200-horse power; two reservoirs of about 10 acres, containing about 46 million gallons of water; and six filter-beds, having an area of 10¾ acres, with a filtering capacity for 1,300,750 gallons of water per hour. The water from this station is pumped partly over a stand-pipe, 186 feet high, and the remainder through an air vessel, to a height of about 380 feet.

"At Hampton there are two pumping-stations on freehold land, of about 13 acres, belonging to the company, upon which there are five engines of some 350-horse power, together with three reservoirs, covering (about) 5½ acres, and capable of containing from 16 to 26 million gallons of water, according to the height of the river Thames. There are also at this station three filter-beds, the area of which is some 3 acres, capable of filtering about 8,640,000 gallons of water in 24 hours. The water from this station is pumped partly over a stand-pipe, 140 feet high, and the remainder through an air vessel, to a height of 210 feet. At Hampton, on the Sunbury Road, the company have 31 more acres of freehold land for the purposes of further storeage reservoirs, and extension of works in due course, as they may be advised, and circumstances may necessitate.

"At Peckham, close to the Nunhead Cemetery, extension works have been erected upon freehold land, 11 acres in extent, belonging to the company, consisting of four covered reservoirs, having a storeage capacity of about 18 million gallons, 150 and 200 feet above Trinity high water; also engines of 120-horse power for the general high services of the district, but not yet taken into use.

"The Registrar-General's return shows the company to possess about 685 miles of mains and service-pipes, 100 miles of which (mains) are perpetually charged, and could be made available for constant supply should circumstances render it desirable.

"This brings me to the more serious and responsible duty of recording the result of the hasty examination of the general working of the district which, since taking charge, I have had an opportunity of making. I found everything in a most unsatisfactory and disorganized state. The prices paid for work and material were at the maximum rate, with the usual sequel of minimum advantages; the engineer's office was denuded of every requisite, and all information, papers and memoranda of works, past and current, necessary to the efficient conduct of such an undertaking, were wanting. Under these circumstances, a certain amount of valuable time must of necessity elapse before the works can be brought to a proper state of administrative efficiency and the highest results attained upon the lowest possible outlay. Considerable advance, however, has already been made in this direction, and prices for work and material considerably reduced.

"The new works at Peckham, from their mode of construction, and their topographical, and geological position, will require much anxious and careful consideration before I can take upon myself, or impose upon your board, the responsibility of filling them with water and bringing them into active use, especially as no mere inspection of works in their present completed condition could enable any one, who was not present when they were in course of construction, to determine whether or not they might be safely charged.

"The engines and machinery generally are, considering their date of erection, in fair order. Their maintenance and general efficiency, however, are making marked progress, and in time will be quite up to the ordinary standard.

"The cost of pumping, in the past, seems to me to have been excessive. When I took charge, the returns only reached 54,751,057 foot pounds to the cwt. of coal, and at the present time we have reached 67,603,185 foot pounds, with a class of coal not more expensive than formerly, and this return is considerably below the standard we hope yet to attain.

"The present depressed state of the iron and coal trade is favourable for obtaining by tender the supply of coal required for the several pumping-stations, and will decrease the working expenses in this department, rates having been offered considerably below those hitherto paid.

"As will be seen by the revenue accounts, the water-rents continue to show a marked increase, and the various charges ordered by the board will, at no distant date, augment our revenue. At the same time, although great saving in the expenditure during my tenure of office has been effected, the amount available for dividend will be less apparent this half year, in consequence of the burden thrown upon the revenue by innumerable accounts and charges that should have been brought to the knowledge of the board and taken into charge by my predecessor, and paid off several half years since.

"On taking charge, after the retirement of your late engineer, I was, under the instructions of the board, directed to go into the allocation of Messrs. Harvey and Co.'s accounts. I am happy to think that a just and satisfactory conclusion has been arrived at, and Mr. Stoneham's letter, which is *in extenso* before you, need not be further referred to by me. In carrying out this work, I desire to acknowledge the valuable assistance received from your chairman.

"By putting all work and supplies up to tender, and by the careful surveillance bestowed upon quantity, quality, and cost, a proper check upon expenditure has been enforced, which already has resulted in considerable saving.

"Owing to the inefficient state of all the filter-beds, I felt it desirable, soon after coming into office, to direct the attention of the board to this defect, and I am now actively engaged in thoroughly cleansing, reconstructing, and putting into a good and workmanlike condition all the filters at the several stations, and am also constructing in the subsiding reservoir at Hampton a temporary screen, the result of which will be beneficial during the winter floods, and tend to the better quality and filtration of the water delivered in the district.

"The water supply for building and constructional purposes is receiving attention. At the present time arrears are being collected and paid to the credit of the company's account at their bankers, showing a considerable increase.* This source of revenue, owing to active and proper supervision, is fast increasing, and promises to become a very important item in the company's receipts.

"Proper form of agreement having been prepared and approved by your board, and a careful survey of all manufacturing premises being in hand, efficient measures will be adopted to prevent waste, and ensure the water consumed being duly paid for. The necessity of such a precaution is amply exemplified in cases which have recently come to the knowledge of the board. The question also under consideration—of drinking-fountains and other public sanitary conveniences—will bring in additional revenue.

"The whole working of the establishment is, in fact, undergoing reconstitution. When I became connected with the company as its engineer, the inspectors, owing to the want of proper rules and regulations, acted upon divers principles, as chance, inclination, or interest happened to suggest. A book of regulations, based upon and in accordance with the Metropolis Water Act, 1871, having since been printed and issued, we have insured the adoption of the best known appliances for prevention of waste, in addition to obtaining uniformity of service, and at the same time in accordance with the practice of other Metropolitan Water Companies.

"The only new works in contemplation during the ensuing six months are, as the board is aware, the completion, cleansing, and, where necessary, the reconstruction of filters, and the re-distribution and proper apportionment of the Wimbledon main; also an alteration to the 30-inch main from Hampton to Peckham, that it may be a 30-inch main the whole distance, instead of, as at present, contracted under the river Thames at Richmond to a 21-inch, that the capacity and efficiency of this main may be the same the whole distance, near 18 miles.

"If large concerns are to be conducted upon a satisfactory basis, it is absolutely necessary that order and method be rigidly maintained. To this end the reorganization of the system of collection and the mode of taking into charge the rating of house and other property, will tend to diminish waste, and equalize and lower the per centage now charged to the consumers, and will, in short, be generally beneficial.

"The reforms taken in hand and ordered to be carried into effect cannot fail to show marked results. Already there has been a very considerable increase in revenue and diminution in expenditure, which I have every reason to believe will continue, and in time place the company in the foremost rank of dividend-paying concerns that supply water to this great Metropolis.

"Amongst other measures, much attention is now bestowed upon the prevention of waste in the use of water.

"In conclusion, I beg permission to express my approval of the energy and attention of the engineering staff, and especially may I mention the name of my chief assistant, Mr. J. W. Restler, whose attention and anxiety to render me every assistance is worthy of commendation.

(Signed) "Thos. W. Rumble, Chief Engineer."

The accounts show that the total amount of capital received is £1,789,904, and the total expenditure £1,742,829 6s. 8d., leaving a balance of £47,074 13s. 4d. The revenue account for the last half year shows that the receipts for the past half year were £73,895 16s. 8d., which, added to the sum of £1561 8s. 9d., the balance of £3500 brought over from previous half year to provide for losses, makes the total revenue £75,457 5s. 5d. On the other side the cost of maintenance amounted to £29,855 15s. 9d.; management, £4455 7s. 7d.; amount carried forward to next account to provide for losses, £3500; leaving £37,646 2s. 1d. to be carried to the credit of dividend and interest account. The latter account shows balance from last half year, after payment of dividends to 31st of March, £7967 18s.; interest on deposits, £47 16s. 10d., which, added to the amount transferred from profits, gives a total of £45,661 16s. 11d. On the debtor side the items are—interest on mortgage and loan capital, £9636 10s. 9d., and dividends on preference shares, £12,367 10s., leaving a net balance applicable to dividends on ordinary shares of £23,657 16s. 2d., the proposed appropriation of which is given in the directors report.

Patent Gas Economizer Company, Limited.—A petition has been presented to the High Court of Justice (Chancery Division) for the winding up of this company, which petition is appointed to be heard before the Master of the Rolls on the 16th inst.

The Bromsgrove Sewage Works.—These works, which have just been completed at a cost of about £3500, were formally opened by the members of the Bromsgrove Local Board on the 30th ult. They are situated in a field near Churford Mill, containing about four acres, upwards of two of which are covered by the different filtering-beds. Some five years ago, the board were threatened with an injunction to restrain them from turning the sewage into the town brook, and causing a nuisance by contaminating the stream. They called in the services of Mr. Bailey Denton, engineer, who advised them to purchase about 40 acres of land and carry the sewage a mile away from the present site. This would have cost about £20,000. The board did not feel justified in expending so large a sum, and called into requisition the services of Mr. Taylor, engineer, who prepared plans, which were approved. The consent of the Local Government Board was obtained, and the works were carried out by Messrs. Brazier and Weaver, of Bromsgrove. The sewage is conveyed from the town by a pipe sewer a distance of half a mile, and at the outfall is led into a duplicate set of subsiding-tanks and filter-beds. From the outfall it flows into a shallow tank having an area of 200 feet. In this tank the heavy matter of the sewage precipitates itself. The sewage then passes into a second subsiding-tank, having an area of 900 feet, and at the end of this tank is a wall containing a number of pipes through which the sewage passes, and when the tanks are full these pipes are below the water, which prevents the floating matter in the sewage passing beyond the wall. It then runs into a subsiding-tank with an area of 1600 feet, in which further subsidence takes place. Beyond this tank is constructed a filter-bed of 600 feet area, in which is fixed a perforated floor, covered with engine ashes. The sewage, passing upward and through the ashes, goes over a weir 30 feet wide, by which a very gentle motion is given to the water. It then reaches a fifth tank, and beyond this is another filter, constructed similar to the first, but having a larger area; and, being a downward filter, the sewage passes through the ashes, and thence into an open carrier, which conveys it to the land filters. Each tank is built and paved with brick, the bottom being made to slope to the centre into a well or pit, at the bottom of which is a large brass valve. Into this pit the mud is swept, and passes through the valve into a mud-pit, 18 feet deep, in which is fixed a strong chain-pump, which is worked by two men. By this means the mud is raised to the surface, dried, and sold for manure. The whole of the tanks, wells, &c., are in duplicate, so that one set can be cleaned while the other is at work. After passing through this system of filtration the sewage goes into the land filters, 50 in number, each having an area of 2500 feet, formed by levelling the land and raising round each bed an earth embankment. The land has been closely drained, upwards of three miles of pipes having been used. The sewage passes from the open carriers through sluices into pipes, and on to each bed. The surface soil of each bed is thrown into furrows, and the sewage gradually filters through the ground into the drains, which empty into the main drain. The water comes out clear and bright into the brook. Arrangements have been made for dealing with storm water. Several gentlemen tasted the water, and pronounced it "good."—*Builder.*

* Building supply received from July 21 to Nov. 30, 1875, amounted to £307 12s. 10d., while from July 21 to Nov. 30, 1876, it amounted to £1143 2s.—an increase of £835 9s. 2d. for the corresponding period.

RATING OF THE SOUTHAMPTON GAS-WORKS.

(*In Arbitration—Before* G. POWNALL, *Esq.*)

SURVEYORS INSTITUTE, GREAT GEORGE STREET, WESTMINSTER.

MONDAY, MAY 22, 1876.

SOUTHAMPTON GASLIGHT AND COKE COMPANY, *Appellants*, *v.* THE GUARDIANS OF THE POOR OF THE SOUTHAMPTON INCORPORATION, *Respondents*.

(*Continued from page* 809.)

Mr. *J. B. Paddon*, examined by Mr. CASTLE.

I am a member of the Institution of Civil Engineers, and have been consulting engineer to the Southampton Gas Company for about ten years. I have had experience in the construction of gas-works for some 20 years as the general manager of the Brighton and Hove Gas Company. The only real publication of the Southampton Company's accounts would be made under the provisions of the Gas-Works Clauses Act, but the balance-sheet would be produced to the proprietors at every half-yearly meeting in May and November of each year. The accounts for the May meeting are made up to the 30th of December, and for the November meeting up to the 30th of June. I should think it would take about four weeks after the termination of the half year to acquire any definite information about the gas-rentals, but more than double that time to ascertain the amount in the banker's book, because there are invariably some arrears. The last published accounts in existence on the 15th of July, 1875, would be the accounts up to Dec. 31, 1874.

Mr. BULLEN: They are published to the proprietors, but not to the guardians.

The ARBITRATOR: The only main difference is that the shareholders can get a copy of them?

Witness: Yes.

The ARBITRATOR: What do you mean by the publication of the accounts?

Mr. CASTLE: It is made under the provisions of the Gas-Works Clauses Act, which says a copy shall be deposited with the Clerk of the Peace.

The ARBITRATOR: And is it not usual for the gas company to send a statement to the shareholders?

Mr. CASTLE: It is a very general thing for companies not to publish them. The accounts as audited for the company are used at the meeting, and that has been the practice of this company. At all events, the last accounts that could be got at for the balance would be up to Dec. 31, 1874?

Witness: Yes; and they would undoubtedly have been available for the parish officials if they had asked for them. I have taken the accounts ending at that date as the only ones a hypothetical tenant would examine, and I heve made my valuation upon those figures.

By the ARBITRATOR: The accounts are not made up quarterly. The items would be ascertained so far as related to the management, but nothing on the other side would appear. The receipts for the quarter ending Lady-day would be known.

The ARBITRATOR: And this rate was made on the 5th of July?

Witness: Yes; but not on the general balance, but on one side of the affair.

Mr. CASTLE: As a fact, we find the accounts are published by Jan. 31, 1876, for the year ending June 30, 1875, and are deposited with the clerk of the peace?

Witness: Yes.

Mr. CASTLE: In March, 1876, there was a reduction in the price of gas?

Witness: Yes.

Mr. CASTLE: Between January and the time of the reduction there was this litigation, and some litigation before Parliament?

Witness: Yes.

Mr. CASTLE: Had it not been for that, would not the reduction, in your opinion, have taken place earlier?

Witness: I am not prepared to say, for the reduction was governed by those things. I have taken the total income of the company for the year ending Dec. 31, 1874, at £43,049 6s. 9d., after deducting the amounts taken elsewhere, amounting to £105.

Mr. BULLEN: A different sum to what it was when we were before the Recorder.

Examination resumed: I put the expenditure at £32,281 0s. 3d., leaving a profit on the whole concern of £10,768 6s. 6d., which I have distributed between the occupiers and the landlord. The occupiers share would be £5346, which is made up by an estimate of the working capital necessary for carrying on the concern, and the value of meters and utensils. The working capital I take at £15,307 0s. 5d.; the value of meters, £8278 10s. 3d.; and the utensils, £3144 15s. 9d.; making a total of £26,730 6s. 5d. I consider that the amount of capital a tenant taking the works would have to find, and upon that capital I allow 20 per cent., made up as follows:—Ordinary interest, 5 per cent.; ordinary trade profit, 10 per cent.; and another 5 per cent. for risks and casualties; thus giving a total of £5346. I am aware that some people say 17½ per cent. only should be allowed; but in the Southampton Dock case 20 per cent. was allowed.

Mr. BULLEN: That can have nothing to do with this case.

Mr. BARROW: It is in the same parish, and it would only be fair that every parish should be assessed *pro ratâ*.

The ARBITRATOR: But if one wrong existed, I should not be justified in doing another wrong.

Witness: I will give you as my reason that the liability to explosion and accident has much increased of late, and 2½ per cent. or so I judge insufficient to meet expenses arising therefrom. Only last year a very serious accident occurred at Colney Hatch. We also had a bad accident with the mains of this company. Deducting the £5346 from £10,768 6s. 6d., leaves £5422 6s. 6d. as the gross rateable value of the whole property. From that I have deducted—for renewal and maintenance, £1878 12s. 5d.; and for insurance, £155 0s. 2d.; together, £2033 12s. 7d.; which gives a total rateable value of £3388 13s. 11d. The £1878 is an estimated amount, based on the life of a portion of the company's property.

Mr. CASTLE: Perhaps the question may arise as to the proportion of the rateable value; will you, therefore, explain to the arbitrator, taking the whole rateable value at the sum you have given us, how you apportion between the different works known as directly and indirectly productive portions?

Witness: I find that the total assessable value of the company's property would be £105,792, which is made up of works and land amounting to £63,258; and mains and services, £42,534; and to that the total rateable value I have given (£3388) is applicable. As to the rateable value of the works and land, I have put it at £2026, and the mains and services at £1362. That is the way in which the amount of £3388 is divided. The sum of £2026 works out to a little over 3½ per cent.

Mr. CASTLE: I believe the ordinary custom has been to allow upon capital sunk in the works or land, in some cases 4 and in some cases 5 per cent.?

Witness: I know of no rule in that way, and personally I should object to any such system as that. At any rate, I have not adopted it. If it were so in this case it would be larger than I have put it, and would practically absorb nearly all the rateable value, and leave nothing for the mains. The greater portion of the £1362 I have abstracted for the mains is for the outlying districts or parishes, for which the company have been already assessed, and the rates have been paid. I find the total gas-rental to be £34,709, and the gas-rental in this particular parish to be £13,927, leaving for the other districts £20,782. The whole of the works and land are in the parish of St. Mary, and I take £546 as due to the rateable value of the mains in that parish, and £2026 as being the whole rateable value on account of the works, giving a total rateable value of £2572.

Cross-examined by Mr. BULLEN: I have had a great deal of experience in the matter of the rating of gas-works. The Hove Company, which I have managed, extend to nine different parishes, and in every one of them the question of rating has been raised, and that alone would give me some knowledge of matters of this kind. I am conversant with the accounts of the Southampton Gas Company. Upon the system on which the company keep their books it would have been simply impossible for them to have ascertained correctly on the 5th of July what the expenditure and receipts had been up to Lady-day, 1875. It would have produced a great deal of confusion to take out the accounts, and it would also have been imprudent. The price paid for the coal could have been ascertained from the books, and also the quantity supplied.

Mr. BULLEN: Having given the total income at £43,049 6s. 9d., you proceed to deduct the expenditure, which you put at £32,281 0s. 3d.; how is that expenditure made up?

Witness: I take the audited accounts as they are presented to the proprietors, and the first thing I do is to make a reduction of £105 for rents received from the total receipts, and I arrive at the sum of £43,049 6s. 9d. Then on the other side I make certain deductions, which will be found in the audited accounts. They are first £2345 19s. 11d., tradesmen's bills for wear and tear. I also deduct rent, rates, and taxes, £1188 5s. 8d.; interest on loans, £1536 3s. 5d.; also balance of profit for the year, £9508 18s. 6d.; making a total of £14,579 7s. 6d. The reason I deduct the tradesmen's bills for wear and tear is because the company's capital account was closed in 1872, and since that time they have had no funds properly available for capital expenditure, and it is said that some portion of the amount charged here for tradesmen's wear and tear represents expenditure on account of capital. It is a very nice point to determine where the expenditure for capital should cease, and where that for wear and tear should begin, but I have chosen to take the amount entirely out, and I afterwards added to the account certain trade charges. From my experience in the Brighton and Hove Company I find that the expenditure for the maintenance of tenants property may be taken at 4d. per 1000 cubic feet of gas, and I know that if that sum be not expended it ought to be, in order to keep the tenants property in a good condition, and for the corroboration of that view I turn to the published accounts of the Metropolitan Gas Companies, where it works out at 4 39d. Having done with my deduction on the first head, this item of trade charges is made up as I describe, and it amounts to £2399 1s. There is also rent of office, £40, which is actual expenditure; the charge in respect to Northam Bridge for permission to carry mains across it, £50; the water-rate, which we actually pay, £27; and also rates of 7s. in the pound on the annual assessment of £3400, which amounts to £1190; and these would bring my list of additions to £3706 1s. That added to the amount previously arrived at of £28,574 19s. 3d. would make up the sum expended to £32,281 0s. 3d. I do not think the audited accounts show actually the amount expended in trade charges. I think the items show the actual amount of expenditure, but they do not show what the proper charge of expenditure is on account of wear and tear.

Mr. BULLEN: Tradesmen's bills for wear and tear £2345—you charged actually more than was expended?

Witness: It would be impossible for the tenant to keep a property in right condition at a less charge. In a previous year they possibly expended much more. Gas companies would probably expend more in one year than in another. I cannot tell the amount for extensions, because I have taken the item in its entirety from the accounts. I am, however, no longer concerned about that, because I have substituted something else for it. I am not aware that the renewal of mains has been charged to and paid for out of capital. If new mains have been so paid for, it is just what ought to have been done. The trade charges do not include the supply of any materials at all, they only include what it is necessary to make up. The gas company could not supply the consumers outside Northam Bridge without the consent of the bridge authorities; and so long as they have the use of the bridge, for the purpose of trade, they have to pay the sum named for it, and it is as much a revenue charge as 100 tons of coal would be. I cannot say what is the present price of coal. During the year ending Dec. 31, 1874, the actual quantity consumed was 16,113 tons, at the average price of 24s. 6d., including everything. Since that time the consumption must have been more, because the trade of the company is an increasing one, but I cannot tell you how much more. The quantity of gas which issued from the works of the company in 1874 was 143,943,000 cubic feet. I cannot say the quantity made, but I reckon the leakage about 8 or 9 per cent., which would bring it up to nearly 156 millions. I think the rate of increase in the consumption is about 6 per cent.

Mr. BULLEN: Your evidence was taken before, and I think you gave the rate of increase during the last nine years at 6½ per cent.

Witness: I think it is very likely, taking nine years.

Mr. BULLEN: Your evidence was then given for a different object?

Witness: The corporation were then in negotiation for buying these works. If I stated then that there was every reason to expect the same rate of increase for the ensuing ten years, I have no doubt it was correct. The item of £213 10s. for purifying materials was taken from the company's books, but that item varies according to the quality of the materials. Sometimes more or less would be used, and sometimes more or less coals would be required than at other times. The sum of £4076 5s. for wages and salaries is also taken from the books. As regards the coals, I should recommend the company never to have less than 60 days supply, and even that is within the practice of other companies. I look upon Southampton as an exceptional place in this particular, inasmuch as they have not a network of railways there, and it is very difficult indeed to get coals by rail. The stock kept on hand must be determined very much by the position of the works. For instance, if there was a colliery just outside the gates, you do not require to keep such a large stock as you would if you had to bring the coal 500 or 600 miles. I do not know the cost of the freight. The 250 tons of purifying material I have allowed is unquestionably necessary; it is usual to keep a much larger stock.

Mr. BULLEN: Can you tell me whether or not the purifying materials, put down at £279 12s., is the proper amount of stock on hand?

Witness: I should say it would cost that.

Mr. BULLEN: For the whole year the expenditure is only £279, and yet you require £566 to be kept in stock?

Witness: I do. That is 2½ years supply, and you would require to have, at least, two years stock in hand. This oxide is used alternately over and over again. A certain quantity is taken off after having been used for some time, and removed to some other place before being fit to be used again; and it has to remain idle. I know not how it is used; but I find in the published accounts that you can only charge the sum of £279, and you require a stock worth £566. The sum of £500 I have put down for oil, bolts, materials for various workshops, &c., has been taken, to a certain extent, from an examination of the stock; but I know it is a very fair sum as an average amount, and sometimes I should expect to find more than that. In addition to those stores there would probably not be less than 20 tons of blacksmith's iron; that is about the quantity I should keep myself. The item of £224 for goods, tools, engines, &c., refers chiefly to engines, forges, and things of that kind. The item for sundries, £110, was an amount not included under any of the previous heads, and the cash for wages was simply an estimate, for the reason I have previously given—that the company's accounts are only balanced twice a year, and it is extremely difficult, with any process of that kind, to get at interim charges. For the year 1874 the exact sum was £5584 19s. 9d., and dividing that by 12 shows the average.

Mr. BULLEN: There is a vast difference between January and June; for what month do you take the average?

Witness: For January, not quite the best month. For one of the lowest

months I should take about one-fourth of that. The £6325 for gas-rental represents the gas sold during the first three months in the period referred to. That amount is taken from the accounts. The "Residual products" include the amounts made by the sale of those products during the same period. There is the assumption that those amounts would have been collected during the three succeeding months, although, as a matter of practice, it is not possible to collect the whole of those amounts within that period. As regards the meters, I have taken the makers prices, which I think the company pay within a very small discount indeed—perhaps 2½ per cent. Some of the meters may be very old; they are new plated and new handled repeatedly.

The ARBITRATOR: They always call them in after a certain time?

Witness: Some companies do it through their engineers, but some of them come in quickly enough themselves, and then they are repaired and brought into their original working condition.

Mr. BULLEN: Do you charge the original value of the meters, and also charge a sum for repairs?

Witness: Not for their repair, but for their conversion. It is usual for meter manufacturers to agree with a company to maintain their stock of meters at one uniform figure—at the rate of about 5 per cent. upon their cost, so that a company under such a contract could always value their meters within 5 per cent. of their original cost. The stamping is repeated every time they are repaired. I do not assume they will require repairing once every year. The item of £114 5s. 6d. for stamping the meters is an annual charge on the value of the meters as they exist. The sum laid out upon these meters, exclusive of ordinary repairs, is £10,348, from which I deduct 20 per cent. for depreciation, but that is rather in deference to custom; perhaps a less amount might be sufficient. The purifiers are in very good working condition, equal to new. They are continually being renewed, only remaining about twelve months in active use. The proper way to estimate their value is about 9d. per foot, but some will cost double what others do. My estimate to cover the renewal of these sieves is 4d. per 1000 feet. As regards the furniture, I take the company's valuation of the things as they stand in the office. I think the total figure, £1269, is a very small one, compared with the way in which many offices are fitted up. The offices are at different places; some at the works, and others at the company's premises in Portland Street, the rent of the latter being £40. The only thing I should take exception to would be the books, which consist of old ledgers, &c., useful to the company, and valuable to their business, and which are valued at what they cost. The buildings were erected at different periods. I cannot say the difference between my valuation and the actual cost of the buildings. No. 2 retort-house was built by me in 1867, when labour and material were very much cheaper than they are now. I also built the purifying-house, engine-house, meter-house, and boundary wall, and my estimate for those is a shade less than they actually cost. The tanks are made of cast iron, and are considerably out of the ground, and for durability would be vastly inferior to the ordinary brick tanks. I do not feel inclined to put down the average life of a gasholder at less than 30 years; putting the gasholder and tank together, I might say 35 years. I think it would be too much to put the life of such tanks as those at 50 years. The buildings generally I put down at 50 years; the retort-benches and iron-work at 15; the plant and fixtures at 50. The mains are under what they are generally put at, but I think it very fair for the mains of Southampton, because the soil there is exceedingly destructive to iron. I do not think 30 years is too short a time for the mains there. The item of £2899 for renewal and maintenance of plant only represents the charges so far as they relate to tenant's property. If a tenant went in for twelve months, five years, or seven years, he would not be expected to have to spend any money upon renewal and maintenance of mains. They would, however, be subject to ordinary depreciation.

Mr. BULLEN: But you would make him pay, according to Schedule D, for going in?

Witness: No, I should not. You will see the total amount of renewal and maintenance, charged at £1878, is carried down as a statutable deduction.

Mr. BULLEN: You have charged the other as well—one belonging to the landlord and the other to the tenant?

Witness: If you put them together for the rateable value it is so.

Mr. BULLEN: Then, to a certain extent, you have charged them twice over?

Mr. BARROW: One is for the tenant's maintenance and the other is for depreciation?

Witness: One is for the renewal and maintenance of the tenant's property and the other is for the renewal and maintenance of the landlord's property, and they may be very properly added together.

Mr. BULLEN: You make the amount of £1878 for the landlord—what do you have for the tenant?

Witness: The tenant has already been dealt with by the 4d. per 1000 feet.

Mr. BULLEN: What is the difference between the plant charged in the £1878 and the other? What does it include distinct from the other?

Witness: The charge represented by the 4d. per 1000 which the tenant has to find is to sustain retorts, and all those things which are continually being renewed, and which the tenant would have to maintain and give up in the same condition as when he received them. The tenant would take a certain item, amounting to £3144, and then he would be required to keep certain utensils in order, and these are some of the things he would have to keep up out of the 4d. In addition to that, he must make provision for repairing and rebuilding when the works have to come down.

Mr. BULLEN: Is that included in the £1878?

Mr. CASTLE: No amount of repairs would prevent renewals.

Mr. BULLEN: You have spoken of the mains in the outlying parishes, where the company are already assessed; as a matter of fact, is not the additional charge for gas supplied to the outside districts frequently so small as to constitute an injustice to the consumers of gas nearer the works?

Witness: I have known such cases, and I believe at one time it was the case at Southampton, but it is pretty well equalized now.

Mr. BULLEN: Did you give this evidence at the close of last session: "That it is within your knowledge that the additional charge for gas supplied to the outlying districts is frequently so small as to constitute an injustice to the consumers of gas nearer the works?"

Witness: Yes; and only just before that I succeeded in getting a considerable advance of price in the outlying districts.

Mr. BULLEN: Did you state that, taking into consideration the probable increase of consumption, you were of opinion that the difference between the charge for gas in the Southampton and the outlying districts should not be less than 2s. per 1000 feet.

Witness: Yes, but I may explain that by saying that at that time it was intended to very much reduce the price of gas in Southampton; and if reduced below 4s., then I am clearly of opinion that the outlying districts should be at least 2s. more. The present price of gas in Southampton is 4s. 2d. per 1000, I believe. In 1874 it was 4s. 6d. In the outlying districts it is now 5s., I believe. I think the last dividend paid on some of the shares was 5 per cent., and 7 per cent. on others. I cannot tell you the value of the shares. I do not know the amount the company asked from the corporation for the purchase of their works, although I have heard.

Mr. BULLEN: What have you heard? Was it £310,000 that they asked for their works?

Mr. BARROW: I am told you are wrong in your figures.

Mr. CASTLE: One thing was wrong—they did not get it.

Mr. BULLEN: Do you know they were offered £10,200 a year, and they declined the offer?

Witness: Speaking indefinitely, I think the company were offered something like 24 years purchase of the annual profits. The capital account was closed in 1872.

Re-examined by Mr. CASTLE. The coals at Southampton are almost entirely supplied by sea, and should be entirely. If ships become weather-bound they may be indefinitely detained. At Shoreham I have known eight ships laid up at sea for three weeks, and the parties have had to go to London for coals, and make purchases at perhaps double the price that would otherwise have been paid for them.

Mr. CASTLE: I understand you have taken the value of coals at 21s., a ton which is less than you paid during the first half year.

Witness: It was the price put in for the last half of the period to which the working capital can refer. I may point out also that in making this assessment, I departed from a figure which would have told in my favour, in putting down the balance at bankers at £1000, when it was actually £1500, but looking at it as a fair estimate, I struck the £500 off. I took the residual products for the last three months, because that is the only period available for the calculation. In making an estimate for the amount of working capital, we must of necessity take that period of the year which has the largest business. I take the six months ending December, 1874, and being so committed to those six months, and taking the gross amount, I have to look and see what money is likely to come in during that time, and it can only be the money for things produced during the first three months. Therefore I cannot get away from that period. It is necessary to take the heaviest quarter as regards receipts, because a tenant must find sufficient capital to keep things going. If he takes a concern at the lightest period of the year, he must qualify himself to meet the trade at the heaviest portion. With regard to the purifying material, I have taken the smallest quantity that could be reasonably expected to be found on works like these. There are occasions when 1000 tons would not be too much, but it would be an exceptional case, and the amount of 250 tons may be taken, I think, as very fair. At Southampton the oxide would remain a week in the purifiers before being taken out, and about a fortnight before it would be able to be put back. The average trade charges for the Metropolitan Gas Companies for the last six years amounts to 6·39d. per 1000 feet.

Mr. CASTLE: You put down cash and wages for one month; why do you not take three months?

Witness: Because at the end of the month the tenant may reasonably expect to have some rental due on the 1st of January, and that would come in and be available for carrying on the concern. As regards the balance at the bankers, I put it in the light of as much as the tenant would require; but as a matter of fact, I believe the company are required to keep £1500 there. Respecting working capital, my estimate differs from those usually made; some men would say 8-12ths, some 6-12ths, and so on; but I prefer, from an intimate knowledge of such expenditure, to take it out as a matter of fact, and I believe I have taken it very nearly correct.

TUESDAY, MAY 23.

Mr. *R. P. Spice*, examined by Mr. BARROW.

I have been in practice as a civil engineer about 30 years, and have valued gas-works in all parts of the kingdom. I have visited the works at Southampton, and agree generally with the evidence given by Mr. Paddon yesterday. That gentleman allowed 5 per cent. interest, 10 per cent. tenant's profits, and 5 per cent. tenant's casualties. The usual rate for the latter was 2½ per cent. until recently, when some serious explosions took place. I quite agree that, from the peculiar liability of gas-works to accident, 2½ per cent. was too small an amount to allow, although it is sufficient for water and other companies where there is no risk from fire. I may say generally I agree with Mr. Paddon that 4d. per 1000 feet is a fair sum to allow for maintenance, and is borne out by Mr. Field's Analysis of the Metropolitan Gas Companies Accounts for 1874, which shows it to be 4·39d. In this case I do not think Mr. Paddon could give the actual figures—it might be more or less, because there were only 16 retorts renewed in 1874 instead of about 60. The life of a retort being practically three years at the outside, every retort in the establishment should be divided by three, and that would give the number that ought to be renewed every year. I do not know the number at work in mid-winter, 1874; but, judging from the business, I should think 60 at least should have been renewed in the customary course of things; but, owing to the contemplated transfer to the corporation, and also to the company's capital having run out, as little money as possible was spent. The item of 9d. per 1000 for wages quite corresponds with my own experience; and I believe that has been the average for three or four years.

Mr. *G. W. Stevenson*, examined by Mr. CASTLE.

I have had a large experience in the management of gas-works, and have acted for assessment committees as well as for companies in rating cases. I have made myself acquainted with the figures spoken to by Mr. Paddon and Mr. Spice, and entirely agree with them. If from any particular reason the proper number of retorts were not renewed in any one year, the tenant would look forward to an increased expense in the following year. I have examined the figures given for statutable deductions, and generally agree with them. The amount which a tenant should put by for new works was fair. The insurance is less than I pay myself as a tenant of gas-works; I pay 10 per cent. all round.

Cross-examined by Mr. BULLEN: The works are very well situated, being alongside a quay, which is a great advantage. They can send away their residuals as well as receive the raw materials. Mr. Paddon values the concern at £95,152 15s. 5d., and I may say at once that I have not made a structural valuation, but assume these figures to be correct. Gas is made at Southampton on the most economical and approved principles, and the works are very admirably managed. The 4d. per 1000 feet includes the ordinary wear and tear in keeping up the structure. I do not include renewals in that amount, because they are absolute replacements. Mr. Field does not include renewals because all the metropolitan companies charge renewals to capital. That is not the proper way, and I have attacked the companies over and over again in committee for doing so, and they admit it is wrong. I think the 9d. for wages taken in January is fair, and that the way Mr. Paddon has made his calculation is correct, because a tenant must have a working capital commensurate with the calls upon him for the heaviest part of the year. Mr. Paddon takes the half year ending December, 1874, and debits himself with the whole of the expenses of the half year, and then he very properly credits himself with what he receives during that half year. The half year ends in December or June, and it does not make much difference which period is taken. I think it fair to take a half year as a test of the whole year, provided coals and wages are the same. The gas and meter rental should be placed as a deduction from the working capital because it is a receipt. The hypothetical tenant would have to find the meters and would have to pay for them at once. I consider 20 per cent. is a fair interest to deduct on tenants profits; the 5 and the 10 are those usually allowed, but the 2½ does not insure the tenant against risk. I do not think there are any extra risks in connexion with the Southampton Gas Company; but I have known ruinous compensations paid by other companies. Halifax is a well-managed concern, and upon my advice—since I have ceased to be connected with them—they compromised a very serious accident by paying £45,000 and all costs. In that case a mill was burned down and two or three people killed. I do not know a case in which the 2½ per cent. for risks and contingencies has been exceeded; but I think it is time an alteration should be made.

Re-examined by Mr. BARROW: I think the balance at the banker's should be nearer £2000 than £1000 for carrying on such a concern as this. In the present case it so happened that the expenses of the heaviest quarter were diminished by the receipts being those of the lightest quarter.

Mr. *Spice* recalled, and cross-examined by Mr. BULLEN.

There is nothing of any importance in which I differ from Mr. Paddon. The mains inside and outside the borough cost the same price per ton, but the cost of laying the mains in the streets of the borough would be greater. The main outside tapers in diameter. The rental per mile outside would be less than in the centre of the town.

Mr. *Marshall*, examined by Mr. BARROW.

In my valuation I first of all confine myself to the receipts and expenditure of the year 1874, and I find that the receipts from all sources for that year amounted to £43,155, taken from the half-yearly accounts, from which £105 for rent received is deducted, leaving £43,050 as the receipts of the gas undertaking. From that I deduct £386 for the expense of collection, which is included under the head of wages. I then deduct the expenditure, less the rates and wear and tear—such expenditure as a tenant in occupation would incur during the year. These figures are taken from the company's written accounts for the half year, and are the actual figures. The total expenses amount to £28,257, which, deducted from £42,664, leaves £14,407 as the net receipts divisible between the landlord and tenant. My opinion is that the tenant's share of the working capital would be £30,952. The working expenses are estimated at £30,199, and a tenant could not carry on the concern unless he had on entering, assuming he took possession in October, five months working expenses, inasmuch as he would not attempt to collect till about the end of January, and he would require the money to pay all the outgoings during that period. Then, too, a tenant taking possession in October could not carry on the concern unless he had probably cash enough for three average months coal, equal to about two months consumption in the winter, amounting to £4942. He would also have to take to the meters on entry. Mr. Paddon put those down at £8278, but the figures recently given me were £7965, and I have not made the alteration. In the case of utensils my figures are £3306; Mr. Paddon now puts them at £3145. I have made no alteration in either case, so that the increase in the one would about balance the deduction in the other. A tenant coming in at Michaelmas would require six months rate; the probability is he would have to pay three months on entry and at the end of another three months a similar sum, which would require £656. In my opinion he should have a fixed balance at his banker's. The arrangement between the company and their bankers is that they shall always have a fixed balance of £1500, which I have allowed, making a total capital of £30,952. The amount usually allowed as occupiers share of that capital is 17½ per cent.; and I must say that if I had been valuing upon the side of the union instead of the company I should have allowed 17½ per cent., assuming that in the case of the Dock Company the Recorder had not allowed 20 per cent. I think that, as both properties are in the same township, the same allowance should be made in each case. That would amount to £6190, leaving the gross estimated rental, *plus* the rates, £8217 for the whole concern. In the accounts handed in the statutable deductions for the year ending June, 1873, are stated to be £2109; for 1874, £2069; and for the half year to Dec. 31, 1874, £2346, making a total of £6524. I was under the impression that the amounts were for the entire years, but I discovered afterwards I was wrong, and the actual figures I now substitute—viz., for 1872, £1872; for 1873, £2011; and for 1874, £2345, making a total of £6228. I find that the company charged to revenue in 1874 a sum of £664, which in my opinion ought to have been charged to capital, and that brings the amount to £5584, which divided by three gives an average of £1861—that is for wear and tear alone. Another thing I may mention, which I did not know when I visited Southampton. I find that in 1872 the amount I have given includes £707 for taking up a 5 or 6-inch main and putting down a 7-inch one, and for sundry other things which are charged against revenue, and there is just a question whether a portion of it ought not to go to capital. In 1873 the sum of £462 was also included, and in 1874, £355; and the average of those sums deducted from the £1861 leaves £1354 as the average of the three years.

Mr. BARROW: That is to say, the average expenditure fairly attributable to tenant's maintenance?

Witness: I do not say that. It produces such a low sum that I really cannot understand it. It seems to me that the company must have been expending a very small sum of money during these years for keeping their property in repair, and I think this amount should be rejected entirely. I prefer dealing with the matter in the way I have adopted in London and in North Wales, where I allowed for ordinary maintenance and ultimate renewal 4 per cent. on the structural value of the entire undertaking. In the present case I estimate the structural value at £96,000, and 4 per cent. upon that would produce £3840 as the deduction to be made for maintenance and renewal. In my opinion, by adopting that process you get rid of a great many difficulties. I adopted the same plan at Woolwich, Wandsworth, Holyhead, Chester, and other places. That brings the two items—ordinary repair and sinking-fund—to an average of £3840. For insurance £100 is allowed, making the total statutable deductions £3940; and that, deducted from the gross estimated rental, would give £4277. I find the rates come to 7s. 10d. in the pound, water-rate not included. Outside the town the rates are less, averaging about 5s. 6d. Taking those rates at 7s. 10d. gives £1333. The rateable value of the whole concern I take as £3402, equal to 3·4 per cent. of the capital value of the entire undertaking, which I assume to be £103,841. That 3·4 per cent. applied to the structural value, £60,085, produces £2041, to be deducted from the rateable value of the entire undertaking, which leaves £1361 as the rateable value of the mains over the entire system. That, of course, has to be apportioned among the different parishes according to the earnings of the mains in each parish. I, therefore, in the parish of St. Mary made this proportion:—As the total gas and meter rental (£34,709) is to the gas and meter rental in St. Mary (£13,927), so is the rateable value over the whole system (£1361) to the rateable value of the mains in St. Mary's (£546). To that I have added the rateable value of the works and wharf in St. Mary's parish, making a total rateable value of £2587. I have been extensively engaged in valuing gas-works in London for the purpose of the quinquennial valuations. We valued them about the middle of last year, and in every case we based our valuation upon the accounts of the year 1874. In the cases of the New River Company, the East London Water Company, and the Kent Water Company, the same principle was adopted.

Cross-examined by Mr. BULLEN: I am not aware of having gone beyond the figures of 1874 in making my valuations. If the accounts for 1875 are taken, it will certainly be to the advantage of the respondents, but I should not like to commit myself to any sum. I do not quite understand Mr. Paddon's mode of arriving at tenant's capital, and I do not remember having seen it adopted before. In my opinion it should be much more than he makes it; but I will not say he is incorrect. The figures in the document produced before the quarter sessions appear to be correct, but they are put in rather a peculiar way. The rateable value of the works and mains in the town and county of Southampton is there given as £2328, but I suppose that is for the whole of the works. The sum spent on extensions in 1874 was £644 and not £697 as I stated at the quarter sessions. The items were charged to revenue; in fact, at that time the company had no capital account. Mr. Paddon's mode of arriving at the working capital is not the same as mine. I consider that instead of the tenant's capital being only £26,000, it should be at least £30,000. I should imagine the gross receipts for 1875 were more than those for 1874 unless the directors had reduced the price of gas. During the first half of the year 1874 the company paid for coals—2156 tons, at 27s. 10d. per ton; 5422 tons, at 28s. 7d.; and 20 tons of cannel at 55s. 8½d. For the half year ending December the amounts were—1297 tons of coal, at 28s. 7d.; 7146 tons, at 19s. 4d.; and 72 tons of cannel at 55s. 9½d. In the first half of 1875 the company bought 1122 tons of coal at 19s. 4d.; 6369 tons, at 19s. 1½d.; and 63 tons of cannel, at 55s. 9½d. During the last half of 1875, 1857 tons of coal were bought at 19s. 1½d. per ton; 6776 tons, at 16s. 4d.; 11 tons of cannel, at 55s. 9½d.; and 15 tons, at 50s. 8½d.

By the ARBITRATOR: In 1873, 2039 tons of coal were bought at 18s. 3d. per ton; 5323 tons at 18s. 4d.; 27 tons of cannel at 38s. 11½d.; and 7 tons at 55s. 10d. During the last half of 1873 the quantities were—1916 tons of coal at 18s. 4d.; 6234 tons at 27s. 10d.; 16 tons of cannel at 55s. 10d.; and 13 tons at 55s. 8½d. I am not in a position to say how the difference arises, or whether the company have a contract for the whole year. Perhaps there were a certain number of tons under the old contracts remaining in stock.

Mr. BULLEN said it would perhaps be more convenient if the company were to produce their contracts.

The SECRETARY said they were simply letters; but he was prepared to state that the figures now given were truthful.

Cross-examination resumed: I cannot say whether the average cost of repairs for the last seven years was £1305; but I can say that the company are extending their property every year, so that the cost seven years ago to keep the works in repair would not apply to this period at all. In 1871 the amount was £1059; 1872, £1252; 1873, £2109; 1874, £2067; 1875, £2324.

Mr. BULLEN: Do any of those figures include renewals?

Witness: I mentioned that, in 1872, £707 was expended in taking up a 5-inch main and putting down another one; but I am not aware that any other portion was for renewals at all. My substituted figures include the repairs and renewals. I take it generally at 4 per cent. on the structural value of the entire undertaking. If I had been on the other side I should have adopted that plan without going to the books at all. I have been instructed to-day to value for ten unions, and shall adopt that plan.

The ARBITRATOR: Without reference to the age of the works?

Witness: Of course the older the works are the more will be required. Gas-works are generally built in a substantial manner.

The ARBITRATOR: And are these not particularly substantial?

Witness: Yes, very substantial.

The ARBITRATOR: It appears to me that the application of the principle would depend upon the character and state of the works?

Witness: For exceedingly old works 4 per cent. would possibly not be sufficient.

Mr. BULLEN: You have allowed for three months coal in stock; do you think that essential?

Witness: Undoubtedly. I think a tenant coming in at Michaelmas certainly ought to have sufficient capital to allow him to have two months consumption in the winter. I do not care whether the company had that quantity or not; but an allowance should be made for sufficient capital to provide for that consumption. They receive their cannel by rail and their Newcastle by water, but whether by steam or sailing ships I cannot say. I arrived at my calculations about coal by the amount actually expended for the year 1874. I dealt with the figures for that year for the rate made in July, 1875; and I do not care if that year was exceptional or not. If it was an exceptional year they must have an exceptional rate.

Mr. BULLEN: But you have taken an exceptional price.

Witness: The price was exceptionally high.

Mr. BULLEN: For the last seven years has not the price been 17s.?

Witness: I cannot say without going into the calculation, but I should think 17s. too low. With regard to the amount received from the sale of the old materials upon renewals, the items do not appear in my statement, because they are deducted from the tradesmen's bills. The credit for old meters in 1874 amounted to £52, and that, deducted from £697, made the amount I said ought to be charged to capital instead of to revenue in the last half of that year.

Mr. BULLEN: As to your 20 per cent. I understand it is because the dock company obtained 20 per cent. that you also take it here, both being in the same parish?

Witness: My practice is to take 17½ per cent., but I say that considering the dock company's property and the gas company's property, the same should be allowed. My evidence in the dock company's case was 17½, and Mr. Ryde's was 20; now I suppose he is going to say 17½ while I say 20. The 20 per cent. was allowed by the Recorder, and the risk here is quite as great. In order to arrive at the structural value, I made my calculations quite independently of Mr. Paddon, but there is very little difference. The land I estimated at 8s. per superficial yard. I make the entire rateable value of the property £3402 based upon the accounts for the year 1874. I should, however, say that if you took the accounts for 1875 and made a similar valuation it would probably have the effect of increasing it to £5000 as against £3402. The rates must vary according to the profits of the year preceding the making of the rate. There has been a great reduction in price. I was not consulted by the company when negotiations were entered into between the company and the corporation for the purpose of the latter taking over the works.

Re-examined by Mr. BARROW: I have not gone into any figures except those for 1874. The accounts for 1875 would not include the reduced price, because the reduction was not made until March, 1876. Coals went down, and in October or November last the directors intended to reduce the price, but when they found their rating so enormously high they were afraid to make the reduction for fear of what the litigation would cost; they then made a reduction which would, I think, reduce the rental about £3000. I could not say positively what the rateable value now would be, without going into the figures. I was speaking roughly when I said £5000, and that sum had no reference to the figure ending June, 1875.

The ARBITRATOR: We all understand it was not the result of minute examination. It is only your impression.

Witness: If you take the accounts up to June, 1875, instead of for the whole year, I should say the probable value would be £4000.

Mr. *T. Hawksley*, examined by Mr. BARROW.

In estimating the structural value of gas-works, my usual practice is to charge an average of £400 per retort at the present time. At places dearer than in London it would amount to about £500 per retort, and in cheap places in the provinces it would be as low as £350. In Southampton the structural value may be taken in a general way, and for rating purposes it may be put at £400 per retort. I understand there are 268 retorts at Southampton, but I have not been to the works recently, although I knew them very well a few years ago. If the works are now in good condition, as they were three or four years ago, £400 would be fair, and 268 retorts would represent——

Mr. BARROW: £107,200. Assuming that to be a fair value, what do you say would be a fair rental for a tenant to give?

Witness: Gas-works now usually cost from 2s. 6d. to 2s. 8d. per head, and, in my opinion, it would not be fair for a tenant to give more than 3 per cent. upon that amount. This is not a case of ordinary trading. If a person goes into a manufacture, he makes what he can by it; but, in the case of gas or water works, the Act of Parliament steps in and says, "You shall not make more than a certain amount, whatever your capability may be; you shall only make so much per cent. for your money;" and while everybody else is making 10, 15, or 20 per cent., gas companies, be their circumstances what they may, are limited to a particular amount, and therefore that limits what anybody would give for the undertaking.

Cross-examined by Mr. BULLEN: The 3 per cent. I have mentioned is upon the total capital which is in use; not upon that which may nominally be in the books of the company, but that which is represented by the rateable subject matter, with the exception that the meters and certain other things must be taken off. I do not know how the meter system is conducted at Southampton,

but meters are let on hire in other places, and the judges have decided that meters are not part of the rateable subject matter, and I have not included them in the £400 structural value.

Mr. BARROW said that closed the case on behalf of the appellants.

(To be continued.)

HORNCASTLE GAS ARBITRATION.

SATURDAY, SEPT. 30.

(Before Mr. ALFRED PENNY, C.E., *Umpire; and Messrs.* R. P. SPICE, C.E., *and* G. W. STEVENSON, C.E., *Arbitrators.)*

(Continued from page 815.)

Mr. *Hunter* recalled, and further examined by Mr. SOMERSET.

On Thursday last I was asked by the umpire for a complete statement, but unfortunately I had to give it from memory, not having one properly made out, and in consequence a few errors occurred. I made a gross balance of £1048 14s. 11d., from which there were deductions amounting to £191 6s. 9d., leaving a balance of £857 8s. 2d. I was endeavouring to give what Mr. Stevenson stated in the House of Commons, and I find I made a mistake. He there said 14s. was the actual cost of the manufacturing charges in the year 1875, consequently whatever applied to the first account applies to this, and I make off, the £857 8s. 2d., the following deductions:—Renewal of retorts, £40; Renewing meters, £12 10s. 6d.; renewing lamps, 17s. 9d.; renewing 1½-inch main, £14; additional to salaries, £76 18s. 1d.; bad debts, £20 12s. 2d.; interest on floating capital, additional, £18 14s.; making a total of £183 12s. 6d. These are additional items not referred to in the House of Commons evidence, and not included in Mr. Stevenson's 14s. per ton of coal for actual cost of manufacture charged last year, on which basis the £857 8s. 2d. is arrived at, and should, in my opinion, be deducted from that sum, thus—£857 8s. 2d. less £183 12s. 6d., as by the details just given, leaving a balance of £673 15s. 8d., which, multiplied by 16¾, gives £11,229 14s. 6d. The above calculation is based on only 1015 tons of coal, whereas the receipts were from 1166 tons, which quantity was used, and the difference of 151 tons at 23s. 3d. is equal to £175 10s. 9d. As this last item is a departure from the evidence given in the House of Commons, and I agreee to deduct that from the account, I am prepared to allow the company the extra gas supplied, and which they said was not charged for, which I find would realize £119 12s. 6d. That leaves a balance against the seller of £55 18s. 3d., which I multiply by 16¾, making £931 17s. 6d.; deducting that from the £11,229 14s. 6d., brings out a balance of £10,297 17s. In my evidence I stated that the 1166 tons of coal paid for did not represent the amount that ought to be charged for carbonization in 1875, and I take it in this way: If 150 tons were in stock at the beginning of 1875, and 150 tons remain in stock at the end of the year, the stock at the end of the year was of less value than at the beginning, and consequently the difference in the cost ought to be charged to 1875. For the beginning of the year I took Mr. Boulton's figure of 23s. 3d., and at the end of the year I take the 17s. 1d., showing a difference of 6s. 2d. per ton, which, multiplied by the 150 tons, gives £46 5s.; multiplying that by 16¾ shows £770 16s. 8d., and deducting that from the £10,297 17s. leaves £9527 0s 4d. Then the same deduction for work not done ought to be made here, which leaves a net balance, showing the value of the undertaking, according to the evidence in the House of Commons, subject to the alterations I have named, of £9171 0s. 4d.

Mr. TAYLOR said the present calculation appeared to be a different thing altogether from the previous one, and therefore he did not propose to cross-examine upon it.

Mr. *Boulton* recalled, and further cross-examined by Mr. SOMERSET.

Mr. SOMERSET: Have you with you the petition lodged in the House of Commons by the local board?

Mr. TAYLOR inquired what line his friend was going to take. If he proposed to bring out any evidence which would help the arbitrators to arrive at the divisible profits as contemplated by the Act of Parliament, he had no objection to make; but, if he was going simply into all those details as to what Mr. Boulton said, or what he did not say—which could not in any way affect the divisible profits of the company in the slightest degree—he most strenuously objected to such a line of examination being pursued.

The UMPIRE said he did not think he was at liberty to refuse to listen to the questions.

Cross-examination resumed: There had been a long correspondence upon the subject of purchase and sale, but at the time our petition was lodged those negotiations had ceased. I gave Mr. Stevenson all the evidence he asked me for, but I do not now know what it was.

Mr. SOMERSET: I ask you whether there are any figures you gave to Mr. Stevenson which you can say were true?

Mr. TAYLOR: I do not think that is a fair way of putting a question.

The UMPIRE: It is competent for the witness to say what is true, and make out his own case.

Witness: I decline to answer such a general question. If you will put to me a specific question I will try to answer it. The price of coal is true, because I made it out from the invoices from June to June in each year. I cannot remember positively, but I do not think we had an ounce of coal from the Strafford collieries of any sort or kind during that period.

Mr. SOMERSET: Is it not true that you led Mr. Stevenson to believe, the committee to believe, and every one else to believe, and did it intentionally, that it was for 1875, and 1875 alone.

Witness: No; I deny it emphatically.

Mr. SOMERSET: Did you tell Mr. Stevenson that there was anything with regard to 1874 in it?

Witness: I did, because I gave it as one year. He asked me for the last year, and at that time our year had not finished.

Mr. SOMERSET: Does it not appear that the accounts supplied to Mr. Dixon by you were given for the whole year 1873, the whole year 1874, and the whole year 1875, and not divided as you state you divided the others?

Witness: I supplied that table, but I will explain. Our gas-rentals used to be collected in October and April, but we found that to be very inconvenient, and about the year 1871 we changed the collection to June 30 and Dec. 31; and I began with the last year first—that is 1875—and went upwards.

Mr. SOMERSET: Why did you state that 1015 tons of coal were carbonized in 1875 when you knew there were 1166?

Witness: I sent to the manager to know how many tons were used, and he made up the account, and made it 1015; but forgot, and did not find it out till months afterwards, that he had omitted the coal that was on hand. I supplied Mr. Stevenson with the figures of 9300 feet per ton of coal.

Mr. SOMERSET: Did you not know that what Mr. Stevenson would say, and did say, would be entirely untrue—viz., that it was a very creditably-managed concern—whereas if you had given a truthful figure it would have been 800 or 900 feet less, and that, therefore, he could not have made the same observation?

Witness: No; I did not. I did not know what Mr. Stevenson wanted it for. Mr. Stevenson asked the question, and I told him; it was a sort of conversation. I heard the evidence given by Mr. Dee; but it is not a fact that when I went back to Horncastle I stated that I had done the local board. I heard some such rumour, and denied it entirely.

Mr. SOMERSET: At the very moment when you heard that rumour, were you not preparing that account which you have sent in, and which is entirely different from your evidence in the House of Commons?

Witness: No; I never began to prepare that account until after the 30th of June. There is no depreciation mentioned in the account, and I do not think that item should be considered, because the works are all new. I think the number of public lamps were more in 1875 than in 1874. Half of 1875 the public lamps were paid for by contract, £3 per lamp, and the latter half by meter. It cost a considerable amount more for the first six months that they burned by meter, than it did by contract; but the next six months not so much. When the half year was up we sent in our claim to the local board, and I have the counterfoils.

Mr. STEVENSON: In your evidence in the House of Commons you allowed 1s. per lamp for depreciation. You thought depreciation in other matters ought to be deducted there, but you think not in the matter of purchase.

Witness: Lamps wear out, but it is a long time before buildings do. In my account I allow nothing for expenditure upon the cost of renewing the five burnt-out retorts, at £8 each, nor the cost of renewing the meters, lamps, nor the 120 yards of main. That 120 yards ought not to be taken into account, because that was a new main, laid in September, 1875. The cost of laying down that main ought not to have been included. I did not know that Mr. Dixon had made an application for his salary to be raised to £150 till I heard it here. In May this year he said he should like to have a little more, but he made no formal application for it. There is nothing in my account for bad debts, because it was forgotten; we scarcely ever have a bad debt. There is also nothing down for interest on floating capital, for insurance of buildings, depreciation of meters, or depreciation on structural value.

Mr. SOMERSET: Then further deductions are made—"Cost of renewing 7 retorts at £8 each. These retorts were renewed in 1875, but in consequence of bad workmanship it became necessary to renew the same in 1876." Is that true, that they were renewed in 1876?

Witness: Yes, it is true; the usual number we renewed was one-third.

Mr. SOMERSET: "Cost of putting governor and scrubber in order, and renewal of original gasholder, £300." What do you say to that?

Witness: We do not want a new gasholder. I believe Mr. Stevenson said we might have a little more gasholder room.

Mr. SOMERSET: The 1½-inch pipe was taken up and renewed with a 3-inch pipe. Where does that appear in the account?

Witness: The 3-inch pipe was in stock, having been bought a long time previously.

Mr. SOMERSET: There is one question I ought to ask about that £5000 which you put in the bill which you brought before Parliament and wished to have capitalized. Have you any book which shows that you did save that sum between 1856 and 1875?

Witness: Yes; it was produced in the House of Commons, but the book has been mislaid.

Mr. TAYLOR: I should very much like to know what this has to do with the divisible profits?

Mr. SOMERSET: I do not know that the partnership ever saved £5000. I shall put it to the umpire, with what success I do not know, that that £5000 is entire fiction. (To witness:) I want to know if you can support it in any way?

Witness: I had a book and I showed it to Mr. Lass.

Mr. SOMERSET: Is there anything in your evidence before the House of Commons, or in any portion of anybody's evidence before the House of Commons showing that your divisible profits for 1875 were more than your dividend of £540 paid?

Witness: There is a minute in our minute-book. The dividend there was the dividend for the year ending Dec. 31, 1874.

Mr. STEVENSON: I think the dividend is really for the year ending June 30, 1875.

The UMPIRE: I think it is very clear that it must be for a portion of the year 1875, if it is not all.

Mr. TAYLOR: It is really, as a matter of fact, the last half year of 1874 and the first half of 1875.

Mr. STEVENSON: Was any portion of the £540 payable in respect of any dividend for the year 1875, or was it in respect of dividends from Jan. 1 to Dec. 31, 1874?

Witness: The latter. The dividend for 1875 was paid in July, 1876, and amounted to nearly £1300.

The UMPIRE: There is certainly this difficulty meeting me, that in this tabular statement for 1875 it is stated that they have paid for that year £540.

Mr. STEVENSON: The witness explains it that they appear *in* that year, but not *for* that year.

Witness: By our deed we are not to declare a dividend until a month after June 30 in each year. The £5000 was deposited from time to time in the bank; but it has been expended upon the buildings. There is no banking book in the name of the company alone.

Mr. SOMERSET: That being so, I give you distinct notice that I ask for the book, for the purpose of enabling you to prove that £5000, which at this moment has no existence, except on your own statement; and I shall ask the umpire to insist on your producing it, or saying you have not got it.

Re-examined by Mr. TAYLOR: When I speak of the 1875 dividend, that was money earned in 1874, although the dividend was declared in 1875. In 1876 we divided our earnings for 1875. We really earned a great deal more than £540 in 1874; but all we thought it prudent to divide was £540, because we wanted to pay for the new retort-house and different things. I never intended to put before the umpire that I was going to take the evidence used before the House of Commons as a basis to arrive at what the divisible profits were.

Mr. TAYLOR: Will you give me, in your own words, the method you took of arriving at the price for coals which you gave before the committee?

Witness: I considered—and I spoke to another person who also considered—that the price of coals taken in September and April in each year is the average price for the year, because after August or September coals are generally raised a shilling, and they are generally dropped at the end of March. I took the price in 1875 from Sept. 2, which was the middle price for that year. There was one quantity at 7s., another at 15s., and another lower; and I took the price on April 3, which was 8s. added to 8s. 6d. carriage, and that gave 16s. 6d. and 23s. 3d. Although that may not have been the most accurate way of arriving at the average, I thought it to be the correct way. At the time I made these statements I believed them to be true. I never answered a single question, nor by any statement did I ever attempt to induce the committee of the House of Commons to believe what I thought was not true. There was no contention between the parties before the committee as to the high price charged for gas. Mr. Stevenson suggested the diminution from 6s. 3d. to 5s. 10d., and that price was put forward by us and accepted by the local board. The board, who have now taken advantage of that high price, have never intimated that they consider it too high.

Mr. TAYLOR: You have been cross-examined as to the cost of each lamp per annum, and so on, and you charge interest at 5 per cent. on the cost of the lamps; do you know that 10 per cent. is the usual charge for that?

Witness: Yes; and it was stated in the House of Commons that we made a very low charge.

The UMPIRE said he should like to ask Mr. Boulton whether the profits for 1875 were not the £540, *plus* something else, which had not been brought before them. The impression conveyed to him by the answers given by Mr. Boulton all through was, that the tabular statement which was in evidence before the House of Commons was the true evidence, stating what were the profits for the year 1875, and that the whole question to which the cross-examination had been directed was as to whether the £540 was the sum divided and not the sum divisible. If that was so, quite a new state of things was now being brought out—that that was entirely untrue, and that the profit for 1875 was a sum of £1200 or £1300.

Mr. TAYLOR: The £540 was money earned in 1874.

The UMPIRE: You tell us so now, but this was only brought to my mind incidentally. I am not at all clear about these matters, but the impression on my mind, until the minute-book was produced, was that the £540 was a portion of the profit of 1875 which had been given to the shareholders, there being something else behind, no matter what it was; but this is entirely a new state of things.

Mr. SPICE: All I can say is that I never had any idea whatever but that the £540 was the principal part of the profits made in 1875. I had no idea that part of 1875 was included in 1874; and certainly with regard to the £540, I thought I was allowing a liberal margin when I went up to £700, as the possible amount of divisible profits which would have to be multiplied by 16⅔.

Mr. TAYLOR: You see the dividend was paid in September.

Mr. SOMERSET: But the way it is put now has only been started this morning.

Mr. STEVENSON: It is like everything else here; all the accounts are in a muddle.

Mr. SPICE: It not only appears to be a case of muddle, but of misrepresentation.

Mr. TAYLOR: Mr. Boulton was the first witness before you from whom I could elicit this. It was called, rightly or wrongly, the 1875 dividend, but it was not money earned at that time.

Mr. SPICE: There is nothing in the proceedings before the House of Commons as to when the dividend was declared, but all gas companies accounts are made up not later than March certainly.

Mr. SOMERSET said it was a very singular thing that when those statements were made they were never against the vendors. Those gentlemen were asking £4000 for a £1000 share, upon evidence he should characterize by-and-by.

Mr. SPICE said that if the profits amounted to so much, he should like to ask whether those profits did not depend upon the price charged for gas; and if the profits were exorbitant, did it not follow that the cost of the works would also be exorbitant to the purchaser.

Witness said that must be so.

The arbitrators then adjourned for a short time, witness being instructed in the meantime to find the book containing the details of the expenditure of the £5000. Upon re-assembling, Mr. Boulton not having returned, other evidence was taken.

Mr. *Edward Sandell*, examined by Mr. TAYLOR.

I am an accountant, and have made gas accounts one of my specialities. I have been concerned in numerous arbitration cases, among others Peterborough, Hereford, and Northallerton. I have seen the accounts rendered by Mr. Boulton to the local board on the 26th of July, showing the balance applicable to dividend to be £1341 2s. 4d. At the request of the company I went down to Horncastle, and went through this account with the books of the company and with the vouchers. I had access to the invoices and receipts and to the register book of the making of the gas from January, 1874, to January, 1875, and also to a banker's book, and to the accounts made up by the secretary and periodically examined by Mr. Wright. I also had access to the revenue account which had been furnished to the local board. I went through that account with the books of the company.

Mr. TAYLOR: Did you find every item charged there verified by the entries in the books of the company?

Witness: I must qualify that. The vouchers for the payments for coal and all that sort of thing were there; the remainder I took from the weekly book, where the gas manager charged what he paid during the week, and this was verified every week. I found on the receipt side of the account £2942 3s. 9d. I referred to the account rendered to the local board, and found the total expenditure for coals, wages, salaries, wear and tear, &c., amounted to the sum of £1601 13s. 6d. There was an item of £5 18s. 6d. which has been taken exception to, which was for torches sold to the local board, and I have added that to the amount of expenditure, making £1601 13s. 6d. I have gone very carefully into that expenditure, and found that, according to my judgment and the proper way of apportioning that expenditure to capital and to revenue, the revenue ought to have been £1548 16s. 4d. I thus find a difference of £52 17s. 2d. between the figures as apportioned by myself and the account as rendered by Mr. Boulton; the expenditure is reduced by that amount.

Mr. SOMERSET: Then it puts us into the position of having £50 odd more to be multiplied by 16⅔, and I object to that. This is a third account.

Mr. TAYLOR said the figures were precisely the same, but the apportionment of them appeared to be different, because Mr. Sandell charged things to capital which ought to appear there, but which Mr. Boulton charged to revenue.

The UMPIRE: The effect is that the amount of profit is increased, and that will be a different account from anything they have ever seen or heard of.

Mr. TAYLOR: The result will be different, but the figures are precisely the same.

The UMPIRE: How can that be?

Mr. TAYLOR: It may be in this way, because certain items which Mr. Boulton has charged to revenue should have been charged to capital, and certain items which Mr. Boulton has charged as payments in 1875 were payments in 1874.

The UMPIRE: What virtue is there in this sub-section, that you are to furnish the accounts that you are going to stand upon to the local board? First, you have furnished an account in the proper way; then you send in a subsidiary account; and now you seek to prove another account of which you have given no notice whatever.

Mr. TAYLOR: I submit that they have notice, in this way. The object, as I have said all along, is to find the divisible profits; it is perfectly true that we have omitted from the first charge for about a fortnight's make of gas, and unless we have it inserted in our account it is perfectly clear that we are not getting paid for what we have sold.

The UMPIRE: But now we come to a fresh matter altogether, because, as soon as you found that out, you sent in a statement of that account to the local board. This is something entirely new which you are now springing upon them.

Mr. TAYLOR: I admit that we have inadvertently charged to revenue what we ought to have charged to capital, and I desire to put that right.

The UMPIRE: Do you attach any importance or value to this sub-section 6?

Mr. TAYLOR: Certainly.

The UMPIRE: I should like to ask what you expect the arbitrators will do in this matter, because they must attach some importance to it, and you are asking us to disregard it entirely.

Mr. TAYLOR: Sub-section 6 provides that "the company shall, within 14 days of the passing of this Act, deliver to the clerk to the board detailed accounts in writing of all the receipts, disbursements, and liabilities of the company," and Mr. Boulton did so at that time to the best of his ability and knowledge; but that ability, I am sorry to say, turned out to be defective, and because that is the reason, that does not bind the company to accept it. We did not find out that anything required to be altered until Mr. Sandell went through the accounts.

The UMPIRE: When was that?

Witness: I went to Horncastle on the 6th of September.

The UMPIRE: My object in asking was to know whether this which you have found out was since this arbitration commenced?

Mr. TAYLOR: Oh, no.

The UMPIRE: Then I cannot sit here and listen to something you knew weeks ago, and gave no notice to the local board of. The moment you discovered that there was anything further, or any other account, that they were not aware of, you ought immediately to have communicated it to them, and not have waited until the eleventh hour to do so.

Mr. TAYLOR: We are not seeking to make any alterations in the accounts which we have sent in; we are only seeking to explain how they should be appropriated.

The UMPIRE: I quite understand what you mean, but I cannot take the same view of it, because you are going to make a claim of something like £1000 more than you have given the local board any notice that you intended to do.

Mr. TAYLOR: Then I am to take it that the award is to be based upon figures which are not correct?

The UMPIRE: I cannot help what you assume, but we have something to guide us, at all events, now. However they may deal with the second account which you have sent in and given them notice of, you have not the same excuse for the last one, because you have given them no notice of that whatever.

Mr. TAYLOR: It applies equally, I think; and moreover, if the mistake had been on the other side, I fancy the local board would have had the right to correct it.

The UMPIRE: I do not know; but if you press this, I shall ask the arbitrators to retire and consider the matter.

Mr. TAYLOR: I really must press it.

The umpire and arbitrators retired for a short time. On their return,

The UMPIRE said: After some consideration the two arbitrators and myself are not entirely in accord in this matter, and therefore I think, in the exercise of the discretion I am invested with, I should rule that the account which Mr. Taylor is now seeking to put before the arbitrators—that is to say, the third account—cannot be admitted. We cannot listen to evidence about something which the local board have had no notice of whatever. We will hear evidence as to the accounts which were sent in, at the proper time; we will also hear evidence, subject to the remarks I have previously made, as to the second account; but with regard to the other alterations, of which no notice whatever has been given, we cannot take any evidence upon them, and Mr. Sandell must shape his answers accordingly.

Mr. TAYLOR said he should protest against the evidence being rejected, but would confine himself to the points mentioned by the umpire.

Examination resumed: According to the revenue account furnished to the local board, the income appears to be £2942 3s. 9d., but I have gone very carefully through those items, and arrive at the conclusion that the income amounts to £3074 12s. 1d.

Mr. SPICE. I should like to be clear upon this point. I make the difference between £3074 12s. 1d. and £2942 3s. 9d. to be £132 8s. 4d.; am I to understand that that is the amount which was omitted from the year 1875.

Mr. TAYLOR: That is the correct amount.

Mr. SPICE: The evidence you are now going to give, I apprehend, will be to support these figures?

Mr. STEVENSON: That and nothing else.

Mr. SOMERSET: Then, sir, I must make another objection, and this is, that this gentleman, unless he can produce invoices, cannot give proof upon that point. The proper person to have done so was Mr. Boulton, and he was not asked about it.

Mr. TAYLOR said the figures would be proved by the meter-book, which Mr. Sandell would produce, and also by Mr. Dixon.

After some conversation, the UMPIRE suggested that Mr. Dixon should be called, to which Mr. Taylor assented.

Mr. *Charles Dixon*, examined by Mr. TAYLOR.

I am the manager of the Horncastle Gas-Works. At the beginning of 1875 I was very ill, and totally incapacitated from attending to my ordinary duties, among which was that of taking the indices of the consumers meters. I think I began to take those indices in the third week in January. [Books produced.] The make of gas from the 8th to the 21st of January was, in round numbers, 578,000 feet; the amount consumed by the public lamps was 77,280 feet; and about 6000 feet were consumed on the works and at the two directors houses. The unaccounted-for gas, at 7 per cent. on the whole make, was about 41,600 feet. Deducting those items from the total make, leaves a balance of 453,120 feet, which at 5s. 10d. per 1000 works out to £132 8s. 4d. In the accounts sent to private consumers up to Dec. 31, 1874, that amount was included. A portion of the 1½-inch main which was taken up in September was relaid a week or two since. The 3-inch mains were in stock.

Cross-examined by Mr. SOMERSET: I was appointed manager in July, 1856. I am not a partner in the company. During the last seven or eight years I have several times asked for an increase of salary, but I have not received it. The figures I have given as to the make and consumption of gas I took from the station-meter book. I always took the station-meter myself, even during the time I was ill, for I was not incapable of walking about. I had nothing to do with the account not being sent in at the time ordered by the Act of Parliament; I did not have the making up of the account. I told Mr. Boulton what quantity of gas was used, before we went to the committee. I made the receipts out for the gas supplied to the private consumers, amounting to £569 9s. 6d.; I also received the money, which I handed over to Mr. Boulton. I was not consulted by Mr. Boulton with reference to the making up of the account of July, 1876, between the time of leaving the committee and the time it was sent in, although there was no one else on the works who could give such information as I could on the subject. I did not know the proprietors were going to apply to Parliament until Mr. Boulton told me of it in October. It was the common talk of the town that Mr. Boulton had been speaking to Mr. Snartt about the price of coal being different from what he had given evidence upon, by which a much larger sum had been gained than what had been anticipated, or something to the same effect. I gave Mr. Boulton the quantity of gas that had been made in 1875, at the latter end of the year. I did not go through the invoices with him, nor am I aware that any one else did. Last March I discussed with Mr. Boulton the quantity of coal carbonized in 1875, but I did not take into consideration what we had in stock in January of that year; the coal account was, therefore, inaccurate to the extent of 150 tons. We never had what might be called a stock-book, but I knew the quantity we had in.

Mr. SOMERSET: I want to know why, when you knew the quantity you had in, you gave 1015 tons instead of any other figure?

Witness: Because I considered we had 150 tons in stock in 1875, but did not take into consideration the stock we had in 1874; but when I found it was coming to a pounds, shillings, and pence job, I thought the matter over. I did not go thoroughly into the whole position of the company with Mr. Boulton in March last; I was only called into the question about the coal accounts. I was certainly astounded to hear Mr. Boulton's statement that we had been having house coal for two years from the Strafford collieries; we never had any from there to my recollection. The make of 9300 cubic feet per ton was according to my figures, but I did not take into consideration the 150 tons. I did not believe it to be the average when I considered the amount of stock we had in hand at the beginning of the year. I was astonished to hear that the average price for coal in 1875 was 23s. 3d., because I knew it was not so.

Mr. SOMERSET: When you heard the evidence given, that the dividend in 1875 was £90 a share, did you not believe that was for the year 1875?

Witness: Well, I really did not, with the surplus profit.

Mr. SOMERSET: It did not meet your calculation—you did not believe it to be true?

Witness: No.

Cross-examination continued: At the pit's mouth we are supposed to obtain 21 cwt. for a ton; but we have had them weighed at different times, and found them to vary considerably. I am not aware that we left the Worsborough or any other colliery on account of any misconduct in that respect.

Mr. SOMERSET: If you had 21 cwt., that would work out at 7700 cubic feet per ton instead of 9300, would it not?

Witness: I should think it would.

Mr. SOMERSET: Then Mr. Stevenson is more misled than he thought he was, for, instead of getting 9300 cubic feet, you get down to 7700, and that is a serious difference, is it not?—1600 feet per ton wrong. It was, at any rate, a misstatement to the committee of a very serious character, was it not?

Witness: Yes; it was. I know nothing about the laying out of that £5000 which was charged to capital account.

Re-examined by Mr. TAYLOR: With regard to the £540 divided in 1875, I did not imagine that that was the only profit made during that year; but I did not know what disbursements were required for the new buildings.

Mr. SPICE: With regard to the evidence we have heard about supplementary accounts and the quantity of gas consumed in Jan., 1875, which did not come to book till a later period than it should have done, thus giving the 1874 accounts the benefit of it. I should like to get the amounts clear. As we have it now, it appears to be £132 8s. 4d.; but as I have it from another source it was £119 12s. 6d. I have here the readings of the station-meter for each day, from Jan. 1, 1875, to Jan. 14, as follows:—Jan. 1, 44,200 feet; Jan. 2, 42,300; Jan. 3, 42,200; Jan. 4, 31,900; Jan. 5, 43,800; Jan. 6, 45,800; Jan. 7, 44,800; Jan. 8, 42,500; Jan. 9, 45,800; Jan. 10, 47,500; Jan. 11, 33,000; Jan. 12, 40,200; Jan. 13, 45,600; Jan. 14, 42,600; the casting of those 14 days amounting to 592,200 feet. In 1875 I believe the meters were taken from the 12th to the 21st of January inclusive, and in 1876 they were taken from the 3rd to the 8th inclusive. From the 12th to the 21st the average would be on the 16th in round numbers, and from the 3rd to the 8th of January the average would come on the 5th, and therefore the difference for which credit should be given, if any is given at all, would be 11 days, being the difference between the 5th and the 16th. The average of those 11 days is 42,600 cubic feet, and multiplying that by 11 gives 468,600. Then from that I would deduct leakage, which is 6·10 according to your own account, making 28,584, and it follows that 440,016 cubic feet is the quantity which might be charged in the rental; and if 5s. 5½d. is the price realized for all the gas consumed in Horncastle during that year, it should be debited at that rate, should it not?

Witness: Yes; it should.

Mr. SPICE: That 440,000 cubic feet at 5s. 5½d. amounts to £119 12s. 6d., and the difference between that sum and £132 8s. 4d. is £12 15s. 10d. That sum may appear to be insignificant, but it has to be capitalized at 16¾ years purchase, and comes to £213 3s. 10d. Therefore, at the cost of a little time, I must ask Mr. Dixon either to verify or disprove the figures which I have read to him.

Mr. STEVENSON: The witness has not followed your plan at all. He has taken the readings of the meter from the 8th to the 21st.

Mr. SPICE: I heard that plan read, which is not at all a clear one. I want to find how much gas was made, how much sold, and how much it produced. I have gone through it as clearly as I can, and it amounts to £119 12s. 6d.

The UMPIRE: I think what Mr. Dixon has not taken into account is this, that in consequence of falling ill he did not take all the meters on the 1st of January.

Witness: Certainly not.

The UMPIRE: If you are going to reckon all not taken or that was lost in taking the meters, you must take into account all the time there was between the 1st of January to the time your meters were finished taking in 1876.

Mr. STEVENSON: That period is excluded from this witness's calculation, because the first week in January is purposely excluded.

The UMPIRE: Do you take all that into account, Mr. Spice?

Mr. SPICE: I take it all into account.

Mr. TAYLOR: I think the most convenient way will be for me to explain to Mr. Sandell how we have arrived at that, and leave it to the umpire to say which is correct. I shall have to show how I have arrived at my £138, and Mr. Spice has arrived at his £119.

Mr. SPICE: All I wish to guard against is that it should not be considered that the £132 is proved by this witness. The difference is £213; therefore, it is not a trifle. The difference between £119 and £132 is not much, but when you come to multiply it by 16¾ it is important.

The UMPIRE: It appears to me you have hardly done justice to your own case now, because you have made no deductions for the quantity of gas used by the local board, and which is paid for in a lump sum.

Mr. SPICE: I have taken what the local board pay for, and what the retail consumer pays for, and the result is a receipt by the company of 5s. 5½d. per 1000 feet.

Cross-examination resumed: We never had a carbonizing book, nor do we put down the amount of coals used, nor the quantity of fuel, nor anything.

Mr. *Boulton* was recalled, and produced a book which he said was a copy of the one containing the details of the expenditure of the £5000, and which had been mislaid.

In reply to Mr. SOMERSET, witness said he made the copy produced two or three months ago, as he wished for one to keep, and that he had shown it to Mr. Lass.

Mr. *Lass*, in reply to a question, said he had never seen it before.

Mr. SOMERSET (to Mr. Boulton): Does there appear in that book anything with regard to that £5000 or any portion of it?

Witness: Yes; there appears the portion from the year 1863. [Witness pointed out some of the items.]

Mr. SOMERSET: Do you mean to say that the greater portion of those entries was not written at the same time, long after the dates as they are supposed to be there?

Witness: I used to have a rough book, and then copy them, perhaps a week at a time.

Re-examined by Mr. TAYLOR: Every amount that we have paid for works, improvement, and lands, and so on, is included in that book from 1863, in different items.

(To be continued.)

AMERICAN GASLIGHT ASSOCIATION.

WEDNESDAY, OCT. 18.

(Continued from page 817.)

Mr. SHERMAN stated that Smith and Farmer's condenser and scrubber was erected at the New Haven Gas-Works in the autumn of 1874, and gas was turned into it in October. At that time they were having over 50 complaints a day, on account of naphthaline, and in two weeks all complaints from that source had ceased. They had had no trouble at the works, or at the holders, or in the street-mains since. During 1875 they had very few complaints from their consumers on account of naphthaline. During the present month they had had about three a day; but this, considering that they had 6000 consumers, he submitted was a very small number of complaints. In reply to an inquiry, he said they had used the same description of coal all through. Naphthaline seldom came from using very rich coal. Companies using the richest coals had the least trouble with naphthaline.

Mr. NEAL said the Boston Gaslight Company had been in the habit of using Albert coal, and making very rich gas, and they never had been troubled with naphthaline. Last summer they discontinued the use of Albert coal, and then they found out exactly what it was. They commenced to use Albert coal again, and the naphthaline all passed away. He himself had been troubled in the works under his charge very greatly with naphthaline. He was troubled some years ago, when he used Nova Scotia coal and Picton coal. Afterwards he used Westmoreland, Penn, and Youghiogheny coals, and he would be very glad to find a remedy. The disease came on about the time that the warm weather began, and then about the time frost came it disappeared. It came and went like the yellow fever, and was a very troublesome thing to deal with. So far as the company were concerned, of course, they could employ men to remove it, but the chief cause of annoyance was to their customers. He was pleased to hear the explanation of this apparatus; but having been told by Mr. Sherman that, even when it was used, there were still some complaints in regard to naphthaline, he did not think so much of it. He would like to ask Mr Sherman if he made any change in the quality of coal that he ha used since. 1874.

Mr. SHERMAN said when he took charge of the works they used about 30 per cent. of cannel. During the last year they had not averaged over 8 per cent. There was no naphthaline of any consequence during 1875. During the last four years they had been running very high heats, and had had very large yields, which was supposed to produce naphthaline.

Mr. NEAL said this was a new reason for the accumulation of naphthaline. High heats did not produce naphthaline; but if high heats were used, they did not produce coal tar enough to take care of the naphthaline. This was something entirely new to him. If that were the case, perhaps it would be as well to make a great deal of tar and very little gas, and unite it—something like taking blood from one man's arm and inserting it in another's.

The SECRETARY asked whether the use of the scrubber at all affected the candle power of the gas.

Mr. SHERMAN said he was not prepared with a reply, as he did not know the quality of the gas before the scrubber was put up. Their present standard was 16 candles. Previous to the erection of this apparatus, they had over 50 complaints a day. The works were completely choked up with naphthaline, and the inlet and the outlet to the holders were filled with it, but they had not since been troubled with it.

Mr. NEAL said he had had a great deal of trouble both with the inlet-pipe and the outlet. Of course, the inlet-pipe could be taken care of, but the outlet-pipe was for distribution, and it was found choked up with naphthaline to a most annoying extent.

Mr. SHERMAN, in answer to further inquiries, said he could not state how many gallons of tar he got per ton of coal, as he had never measured it. The naphthaline was usually found in the service-pipes of the consumers, and his mode of getting rid of it was to rap the pipes. He had used naphtha also for the purpose, but had never had occasion to employ the force-pump.

Mr. LITTLEHALES thought there was a little misapprehension about high heats and low heats. It seemed to him that high heats converted a great deal of the hydrocarbon vapours, consequently there was not so much vapour to absorb the naphthaline as there would be when the gas was made at a low heat. He thought that was an explanation of the matter.

Mr. CATHELS said he had had a good deal of difficulty from this source, and had adopted a plan by which he thought the trouble was in a great measure remedied. He did not know whether it was quite as excellent as Mr. Farmer's apparatus, for that would appear to be very efficient for the purpose. His plan was to keep the gas in contact with the tarry oils. If too large a quantity of the tarry oils was converted, too little tar was left in the gas for purification. At all events, he thought the plan was sufficiently simple and practical. It was simply to run a pipe, taking care that the pipe was not too large, along the retort-house wall, so as to bring the gas in contact with the tarry vapours. But whatever form was adopted for this purpose, the principle seemed to be to prolong the hydraulic main, or to interpose a sufficient length of pipe, so as to keep the gas in contact with the tarry vapours as long as possible. If that principle was adhered to, he was sure those who were troubled with naphthaline would find the difficulty greatly obviated. He did not suppose that it would do away with it entirely, but it would reduce it to a mere minimum, and bring it down to two or three complaints a day, instead of perhaps 100 or 120. The pipe was run across the retort-house wall into the condensers, with just a slight fall.

Mr. SHERMAN said he was very much pleased with the Graham coil condenser last year, which was put in at Worcester, and as the engineer was now present he would like to ask him how it worked.

Mr. ROLLINS: So far as the condenser is concerned it is very good, but as a preventive of naphthaline I do not think it is worth a cent.

Mr. SHERMAN: It seemed to be a very good thing, but it had not been set in operation before I left Worcester.

The SECRETARY: I think I have a right to say something in regard to the condenser. I used some four or five, and while using them I had no trouble with any deposit in the bottom of my condenser or my purifiers; but as for taking out naphthaline, I do not believe they are worth a penny.

At a subsequent period during the session,

Mr. NEAL, referring to the subject of naphthaline, said he had just heard of a very simple remedy. It was so simple that the gentleman who was speaking to him about it said he was afraid the Association would not think it worth considering, and for that reason he did not mention it. It was certainly very simple, and very economical; and he thought it would do away with Farmer's scrubber or the coil condenser, and the other experiments that had been employed to get rid of this trouble. It was this: A gentleman from Memphis, stated that they were at one time very much troubled with naphthaline from some cause or other, and the superintendent thought he would experiment a little, and see if he could not get rid of it. So he mixed sawdust with his lime (two parts of lime and one of sawdust), that is one-third sawdust and two-thirds lime. This he put into his purifiers, and then turned on the gas; and the naphthaline passed away entirely, and he had never had any trouble since.

The SECRETARY then read the following paper, by Mr. James M. Starr, President of the Gas Company, Richmond, Ind., on

THE USE OF GAS FOR CULINARY PURPOSES.

Having had several invitations from our worthy secretary to present to you an account of my experience and success in introducing the use of gas for culinary purposes in my city, Richmond, Ind., I felt I could not excuse myself from complying with his request, as I think it has been of great benefit to my company and to my consumers, for its convenience and comfort in cooking. The use of gas for cooking has not only retained, during the coal oil *furore* of the last two years, many of our consumers of gas for illumination, but caused many others to fit up their houses for gas-burning.

In my city over 90 per cent. of the dwellings have gas-stoves set, all using them more or less. Many during the warm weather do their entire cooking and ironing with them, others using them only in preparing their morning and evening meals, and some only in preparing tea, being tender on the subject of gas bills.

For ironing it is especially comfortable and convenient, enabling a person to do the work in much less time, and with greater comfort and pleasure.

In heating irons, care should be taken to frequently wipe the moisture off the iron until it is heated, which prevents the iron becoming rough; and in cooking, wide-bottom vessels are the most economical, as the heat has a greater effect on them.

In using them for economy I advise consumers not to cook or boil more than they want. It is not good management to boil a gallon of water when they only want to use a quart. A great deal of the cheapness is due to the fact that the fire is as hot in a minute after it is lighted as it is in an hour, and when the cooking is done by turning off the gas the expense ceases, which is not the case with coal or wood fires.

It was quite accidental my introducing it for cooking, as I had feared it would increase the gas bills so much that consumers would quit burning

entirely. I noticed my servant girl was using, upon a bracket, a little tin gas-stove, and a quart fruit can, for heating water for tea, and other light purposes, when there was not any fire in the cooking-stove, and keeping the kitchen cool and pleasant for her to work in. As my *forte* (if I have any) is to have things handy about the house, I had a convenient shelf made, and placed on it two No. 3 dome stoves, and soon found that about all the cooking of my family was done on them. My people were so pleased with these stoves that I set an experimental meter to ascertain what it cost to cook with them. I found that, with gas at 3·60 dols. per 1000, it cost from one and a half to two cents to prepare breakfast for our family of four persons, and from three to five cents to prepare dinner, also from one to two cents for tea for us; altogether, two to three dollars per month for cooking and ironing. Allow me to add, that these figures require care, and do not include washing, house-cleaning, &c., nor do they apply to very large, expensive families, where several courses are served; but they do apply to the thousands and tens of thousands who would love to have its comfort and convenience, if they only knew how cheaply it could be obtained.

Having ascertained what it cost to cook with gas, it was necessary to find whether it was cheaper than wood; so I had a cord of dry wood weighed, and found, at the prices we then paid for it, with sawing and splitting, the wood cost about 7 dols. per cord; I found that 5 lbs. of wood cost one cent. We then weighed the wood for different meals, and found it cost a considerable per centage more than gas, besides the increased trouble and danger of a wood or coal fire. Many using these stoves say it is not half the trouble to cook with them that it is to cook by a wood or coal fire.

Being armed with these facts, I adopted Mr. Gough's advice on the temperance question, "to agitate." And I did agitate, and agitated, and advertised, and puffed by locals, and talked as I never talked before, that there was money in it. I brought it before the people until nearly all have them, and all new consumers get them.

At first I would put them up to be used a month, and if not liked, to remove them, free of cost. I never had to take out but one set, and in that case the wife objected to her husband having them put up, and she only cooked one meal on them. She was determined not to use them, and she did not, thus verifying the old adage, that

> A man convinced against his will,
> Is of the same opinion still;

and I suppose it is the same with woman.

I have erected at my rooms a cabinet kitchen. I call it by that name, for it looks like a cabinet or library when closed. In it we sometimes prepare a meal for a dozen persons, and then close it up and eat by it, and a stranger would think he was eating in a library instead of a kitchen.

It has a chamber in the upper part, which is connected with the chimney, which takes away all the odour of cooking. We think it is a complete success for beauty, convenience, and comfort. I have endeavoured to lay before you my experience and observations, believing it is the interest of gas companies to bring about a more general use of gas for every purpose to which it can be economically applied, thereby increasing the demand, and consequently enabling them to reduce the price to the consumers, and inducing them to use it in lieu of other more disagreeable and expensive articles.

Mr. NEAL: I would like to ask Mr. Starr some questions in regard to the stove he used—whether it was of any peculiar construction that it is free from smell. In the summer time gas is sometimes used in my house for cooking purposes, and it makes a very unpleasant odour. The great object, it seems to me, is to free the gas from that. Gas-stoves are put up in bath-rooms and sleeping-rooms, but I think they are very unhealthy, as there is always a very unpleasant odour coming from them. Does the stove that you use have any odour to it?

Mr. STARR: I am not troubled with any unpleasant odour, and I attribute its absence to two causes. I use for purification a preparation of iron which I buy at cutlery works—grindstone dust. I put in about 15 inches as a layer of lime, and about 4 inches of the iron. Then, besides that, as I mentioned in the paper, I have a chamber on the top of my stove, which connects with the flue, and the odour passes off up the chimney. I will state that we are not keeping house. We have a suite of rooms, and take our meals at a hotel; but when we have company we prefer to have our meals in our rooms, and they are cooked on this gas-stove, and served on the cabinet, and they do not know it. They are certainly very convenient. There is a great deal of difference in people cooking with gas. Some people will use four times as much as others, and will not do any more cooking. There is one family, consisting of the husband, and wife, and three children. The wife does her ironing with it, and it has been a great success. She does not use it for light. Her gas bill for four months was only 5·70 dols., and she did her cooking and ironing with it. We have cooked dinner on ours, have cooked meats, and prepared coffee, tea, &c., and have had no trouble at all. They are very popular in our town. In regard to the labour, you have no idea what a saving of labour there is. There are no ashes to take care of, and no blacking of the stove to do, and none of the disagreeable smell of grease flying over the stove. It takes about half the labour; the heat is very quick; the stove is just as hot after the gas has been lighted five minutes as it is after it has been lighted for an hour. It is better to have the vessels used in cooking with broad bottoms, as the heat has a better effect. These stoves are being rapidly introduced. There is scarcely a house being built in our town where these stove are not put in. I found out that it was a good thing, and agitated with the results I have mentioned.

Mr. HARBISON: I would like to inquire of the gentleman whether, in making this comparison, he gives an estimate based upon coke or coal. He tells us of the comparison that he made with dry wood, but in many places a large quantity of coke is used for cooking purposes. What will we do with our coke?

Mr. STARR: I would advise you to do as I do. I have the best arrangement in that respect, I think, in the world. Every bushel of my coke is ground. I sold from my works 46,000 bushels of coke ground in this way—what they call pressed coke—all nicely screened and crushed without the expense of a single dollar. It works splendidly. I have an apparatus right at my door, and the men, in shovelling the coke out of the way, crush it. The fine dust I screen, and mix it with a little dust from Youghiogheny coal, and that keeps up all the steam I want. It works very nicely, without scarcely any cost.

The SECRETARY: What proportion of your gas consumption is used in cooking?

Mr. STARR: I could not tell that. When I first commenced, the summer consumption was very light. Our summer consumption has now increased considerably. I wanted to see if I could not find a day use for the gas-mains as well as a night use. I take a very great interest in this question, and I would like to see the subject thoroughly ventilated by the members of the Association, to see what their views are upon the subject of introducing gas for cooking purposes.

Mr. HARBISON: You said that the gas for cooking for four persons would be not over 3 dols. a month, or 36 dols. a year. With coke at 8 cents a bushel, that would be 45 bushels of coke, and I think that 45 bushels of coke would go farther, with a family of four persons, than that amount of money expended in gas; and they will get additional heat for the house in the winter season, which would not be had with a gas-stove, running one hour at a time for the preparation of a meal. We cannot all of us grind up our coke as Mr. Starr says he does his, and the question arises whether the increase in the consumption of gas will reimburse us for the loss on coke, for if people use gas for cooking, we shall have no market for our coke. Pretty much all our coke is used for domestic purposes. We get 8 cents a bushel for it. We find a demand for all the coke we produce, and during the past year we have been obliged to send to New Haven for two or three thousand bushels to keep our customers supplied. We think we make a superior article of coke.

Mr. STARR: We have some very close calculators with us. They measure their coal and weigh their coke, and they consider that coke costs one-half of what hard coal does.

Mr. WHITE: Does that refer to anthracite?

Mr. STARR: Yes.

Mr. WHITE: We have always found that when anthracite coal gets cheap, our coke immediately piles up, and we present it to the neighbouring churches, to distribute among the poor.

Mr. STARR, in answer to a further question, said: The stove I now use was manufactured by Sharp, of New York; but I do not think it is really as good a stove as the one I used first, which was made by a Dr. Musgrave, of Cincinnati; but the trouble with that stove was that there was a wire-screen on the top, and anything falling over it immediately stopped it up; but in the Sharp stove there is a perforated tin protector, so that nothing gets on it, and we have no trouble at all.

Mr. NEAL: This matter of using gas for cooking, and thus providing a use for our mains by day, as well as by night, is all very well. We are looking out for the gas interest, and if we can get the water companies to use our mains, it will be of great benefit to us. I suggested to a water company of Charlestown that they might use our mains by day, and pay us a reasonable rent for the privilege.

(To be continued.)

BIRMINGHAM CORPORATION GAS SUPPLY.

A Meeting of the Town Council of Birmingham was held on Tuesday, the 5th inst.—the MAYOR (Alderman Baker) presiding.

The Gas Committee presented the following report:—

Since the last report, presented on the 1st of August, further progress has been made in the re-arrangement of mains—25,187 yards having been taken up, 16,238 yards of old mains relaid, and there have also been laid 1393 yards of new mains; total, 17,631 yards, being a reduction of 7556 yards, or about 4¼ miles, consisting almost entirely of 2 and 3-inch mains; the total saving in length of mains laid by the re-arrangement from the commencement of the year being about 13½ miles. The total number of services repaired and enlarged since the 30th of June is 2676, or since the commencement of the year 4671, and about 2000 duplicate services have been taken out or cut off in the same period.

Contracts have been entered into as follows:—Evans and Son, three special pumps for Saltley, £400; Tangye Brothers, travelling crane for Windsor Street, £350; Patent Shaft and Axle Company, three turn-tables for Saltley, £354.

With a view to maintaining the illuminating power of the gas, 1000 tons of cannel have been purchased for use at Saltley works, in addition to previous purchases. The average quality of the gas supplied from the various works within the borough, as certified by the official tester, since the 3rd of October last, has been 17·20 candles, being 2·20 candles in excess of the parliamentary standard.

Alderman CHAMBERLAIN, in moving the adoption of the report, reminded the council that the quality of the gas being so much above the parliamentary standard, was seriously reducing the amount of profit, because it cost large sums to keep up the quality, while the quantity of gas consumed was lessened. The quantity of gas consumed during the past six months had not been larger than in the corresponding period last year, although the normal increase should be 6 per cent. This he attributed to the cause mentioned.

Alderman LLOYD moved as an amendment—"That the report be approved, and that the committee be requested to report to the council the principles upon which they propose to apportion between the revenue and capital the cost of any mains or other works which may be in substitution for previously existing mains or works of any kind."

After some remarks and inquiries by other members of the council,

Alderman CHAMBERLAIN expressed his willingness to accept the amendment. In all cases where new mains were laid down, the cost was charged to capital, but when the new main was substituted for an old one, the cost was charged to revenue, and the old one was relaid elsewhere, or kept in store. He believed that the change of the mains would ultimately result favourably to the interests of the ratepayers. With reference to the inquiry as to the probability of a reduction in the price of gas, he thought this was not the time to consider that question, and they could not do so until he presented the balance-sheet. In order, however, that persons might not be deceived, he would venture to express an opinion that no reduction would be desirable in January. In the first place, he doubted whether the profits would justify any considerable reduction; and, in the second place, he must remind them that they had had notice by outlying districts of the purchase of property from them, and until that matter was settled it would be undesirable to alter materially the price of gas. He considered that the present price compared most favourably with the price during the time of the companies. The difference in the cost of production was more than 2d. per 1000 cubic feet, because, although they might get 9000 cubic feet out of a ton of coal, they did not always get it. There was a very heavy waste between the retorts and the meters of their customers. Then there was enormous loss by their not being able, in the present state of the iron trade, to dispose of their coke, which had deteriorated in value. He put down their loss on that score at £10,000. In addition to that, there were other expenses, amongst them the expense of purifying by the lime process. Taking all circumstances into consideration, he thought they were charging as low for the gas as had ever been charged in the borough, and it was lower, with one or two exceptions, than was charged in other towns.

The report was approved.

THE CHALK WATER SYSTEM.

At the Third Ordinary Meeting of the Institution of Civil Engineers, for the Session 1876–77, on Tuesday evening, the 28th of November—Mr. GEORGE ROBERT STEPHENSON, the President, in the chair, a paper was read on "The Chalk Water System," by Mr. J. LUCAS.

Hydrogeology, a term first used by the author in 1874, took up the history of rain water from the time that it soaked through the soil, and followed it through the various rocks which it afterwards percolated. A hydrogeological survey comprehended an examination of all facts bearing on the form and position of subterranean water systems; and, in basins where they were covered by superincumbent strata, the extent to which they were siphonized, together with other particulars tending to show their general capabilities for supplying water. The author had been for some time engaged upon such a survey. His observations on the chalk water system, which extended over four years, included well measurements, to determine the form and vertical limits of the water-line in the chalk.

The chalk water system was bounded by the chalk marl below, and the base of the tertiary strata above. The lower chalk was characterized by few vertical fissures, and the upper by numerous intersecting fissures, the principal water-bearing ones being along the layers of flint. The water in the lower chalk existed as distinct streams, while that in the upper chalk was comparable to a river whose course was through numerous intercommunicating fissures. These streams or jets, when cut in a well, were called feeders. The water-line was the name given to the upper surface of this water. It had been determined by passing a curve through the various points at which the height of the water-line had been observed to stand above sea-level. The water-line in the chalk formed a long inclined plane, terminating against the chalk marl. The water in the chalk was bounded by this line of abutment on the chalk marl. There was, therefore, a considerable strip of chalk in which there

was no water. The line of abutment only rose high enough to pour springs over the chalk marl at two points below the escarpment, between Guildford and Otford. The contours on the water surface accorded with the strike of the beds where there were no great valleys, but swept round the main valley systems, returning to their normal position under the alternate ridges.

The height of the water-line was subject to variation according to the rainfall. The tendency of the water-line was to rise and fall parallel to itself, but the springs at the tertiary base being fixed points, and the main ridge of the chalk escarpment the source of greatest supply, in respect of a cross-section, the line vibrated from those points, the amplitude of the vibration being greatest under the source of largest supply. This was referred to as the natural variation. The total storeage capacity of the chalk drawn upon in nature lay between the two lines bounding the sectional area of variation. The vertical range of the water-line determined the horizontal range of the water contours, which attained their most northerly position at a maximum epoch, and their most southerly at a minimum epoch. The height of the water-line was influenced by local rainfalls, so that it did not vary everywhere in the same ratio between the same dates. It was nevertheless true of limited areas. The amount of varintion was greatest in the lower chalk under the deep valleys springing from the chalk escarpment. The modern beds of these valleys were cut so deep that there was not room for the full natural variation to have play. Whenever, therefore, the supply by rain absorbed exceeded the amount required to raise the water-line to this height, the excess had to flow down the bed of the valley as a stream or bourne. This species of bourne was due to the lower chalk. These bournes sometimes sank again, so that there was a surface stream in the upper part of the valley and not in the lower. A slightly different form of the same phenomenon was shown in the intermittent springs that broke out at the tertiary base. Since the variations in the height of the water-line were the result of excess or defect in the rainfall, it followed that the water-line in every position had an appropriate quantitative value. In viewing these variations over a series of years, a correspondence was observed between the ratio of the mean water-line for each year, and the mean water-line for the whole period, and the ratio of the rainfall and of the rain absorbed during each year, to the mean annual rainfall and the mean annual quantity absorbed during the whole period. In estimating the quantity required by any particular point in the sectional area of variation, the mean water-line and the mean rainfall were the most certain bases of calculation. There were no data for calculating the mean water-line on the area treated of in the paper; but, from materials afforded by the Chilgrove Well register, it was inferred that the ratio of the quantity required by the mean water-line, to that by the minimum, was as two to one, and the ratio of the quantity that would maintain the maximum, to the same, was as five to one. Regarding the oscillations of the water-line during any period, it was inferred:—1. That the mean duration of fall was half as long again as the mean duration of rise; or, in other words, during three-fifths of the period the water was falling. 2. During three-fifths of the period the water-line was below the mean. 3. That the average value of a rise in the water-line was 120 times the depth of rain, to which it was due.

The effect of pumping was—1. To accelerate the rate of fall and to retard or intercept the rise. 2. To prolong the duration of fall, and that of the period in which the water-line was below the mean. 3. To lower the reservoir, or the sectional area of variation, bodily, so as to establish a new system of water-lines. The limited capacity of the chalk water system appeared from the gigantic effects produced by small quantities of rain.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The past week has not brought any change of moment in connexion with the local iron, steel, hardware, or coal trades; yet it is pretty fairly and fully evident that masters are inclined to be firmer, and that the new year will bring a change for the better. All brands of local and northern pig iron remain steadily firm at late rates, the quotations put forward at the commencement of December being nominally the same as those prevailing last month. The Parkgate Iron Company, a large concern a few miles north of Sheffield, have two blast furnaces going, out of a total of six, but have issued a circular to their shareholders, stating their inability to pay an interim dividend, although the business of the company is in a sound and healthy condition, and the assets are real. Merchant irons remain in a state of neglected stagnation, the commoner kinds being practically unsaleable. Some few better home and foreign brands are being bought by the steel manufacturers for converting purposes, but the demand is by no means extensive.

The larger foundries are, perhaps, doing a larger amount of business than any other class of undertakings, some of them being well engaged on large castings for gas and water-works purposes, as well as on four, five, six, and 12-inch pipes for the same class of undertakings. In these last-named articles the local houses meet with a very close competition from northern founders, but their nearness to some of the towns requiring the bulk of the goods enables them to carry off the contracts. One house in the North of England is quoting exceptionally low figures, even for delivery here.

The fuel market remains greatly depressed, and nothing save an extremely long spell of unusually severe weather can by any possibility send up prices. All classes of coal and coke for manufacturing purposes are weak in price, and most abundant in supply, coke being got rid of at 14s. per ton, in order to clear out the railway sidings.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The general coal trade of this district is anything but good for the time of the year, and the present output of the pits is, as a rule, quite sufficient to meet all the requirements of the market, whilst the supplies of some of the inferior descriptions of engine fuel are considerably in excess of the demand, and holders who are not disposed to stock have to accept extremely low prices to effect sales. The unusual mildness of the weather has naturally had the effect of restricting the demand for house fire coal, and this has checked any advance in prices, but the better sorts fully maintain last month's rates. Gas-making coals remain without material change. Business to a moderate extent has resulted out of the inquiries which I reported last week, and a few cargoes for foreign consumption continue to be shipped; but this branch of business, as is usual at this season of the year, is chiefly confined to deliveries on account of the contracts entered into during the summer, and there is comparatively little or no fresh buying. So far as prices are concerned, they continue firm at late rates. In common classes there is a moderate demand for the better sorts, and these qualities are not quite such a drug in the market as they were, but the inferior descriptions are still very difficult to sell, and low in price. Good burgy and the best descriptions of slack move off moderately well at late rates, but poor qualities are very abundant in the market, and lower in price, slack especially exhibiting a weakening tendency. The average pit prices in the Wigan district range about 11s. to 12s. per ton for best Arley, 9s. to 9s. 6d. for Pemberton four-feet, 7s. to 8s. for common coal, 5s. 6d. for burgy, and 3s. to 4s. per ton for slack.

In the coke trade there is still little or no change to report, either as regards demand or prices, the latter remaining at 18s. to 20s. for best cokes, and 12s. to 14s. per ton for common cokes, delivered into the Manchester district.

The officials connected with the Lancashire and Cheshire Miners Union have had the sense to see that the present condition of the coal trade would not warrant them in proceeding to any extreme measures in the vain hope of securing an advance of wages, and they have cautioned the men in the Wigan district not to follow the notices which were sent out by a strike, intimating, at the same time, that if they do they will receive no support.

In the iron trade, the market continues steady. Although consumers are, in many cases, still holding back from the advanced prices asked, makers show no signs of giving way, and remain very stiff in their quotations, insomuch that merchants are very cautious as to quoting for forward deliveries. Lancashire makers, having received orders sufficient to take off their limited production for the present, exhibit, if anything, rather a firmer tone; but there is no material alteration in quotations, and other brands are also without change. In the finished iron trade, although there is not quite so much doing as a week or two back, prices are maintained, and Lancashire bars delivered into the Manchester district are quoted at £6 17s. 6d. to £7 per ton.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There was very little change in the coal trade of the North of England last week. About 80,000 tons of coals were shipped in the Tyne Dock. Two-thirds were gas coals. The price was from 8s. 6d. to 9s. per ton for best, and 7s. for seconds. Very few additional contracts were entered upon last week. There have been numerous inquiries, but there has been a little difficulty experienced in settling the prices. The Durham gas collieries are working very well, and the turns for loading are from six to eight days. The steamers are kept extremely well employed in carrying gas coals. On Thursday, Friday, and Saturday considerable fleets of laden sailing vessels left the Tyne bound for the east coast, British Channel, and France, and many of them were laden with gas coals. Household coals are quoted at from 11s. 6d. to 12s. per ton on the Tyne —that is, coals of good quality. The steam coal business is very depressed, and the output is being considerably reduced by throwing men out of employment, thus making a somewhat better balance between supply and demand. There is great irregularity in the price of inferior steam coal—in fact, in the price of inferior coals generally.

In the freight market coasting rates for steamers range from 4s. 10½d. to 5s. 3d. to London; Rochester, 5s. to 5s. 3d.; Rouen, 7s. 9d.; Havre, 6s. 9d.; Dublin, 6s. 9d. to 8s. per ton; Bordeaux, £8 15s. to £9 per keel. The freights to the Mediterranean are—Genoa, from £12 15s. to £13 10s. per keel; Malta, £9; Constantinople, £13 to £13 7s. 6d.; Alexandria, £11 per keel. The gas companies in Italy, however, seem to have got well supplied with coals for the winter, and trade thence is not so brisk.

The iron trade of the North of England kept pretty steady last week. The best feature of it is the increased local demand for manufacturing iron. Iron shipbuilding is likely to be the leading branch of the trade during the winter, and there are already more orders for marine engines on hand than has been known for the past two years. The shipments of iron also are better.

The chemical trade of the Tyne is decidedly stronger, and the prospects for next year are a good deal more cheerful than might have been anticipated a month ago. There is a good deal of speculation going on in this trade, but beneath it there is a steady inflow of sound trade which is operating upon stocks and reducing them. Merchants are still disposed to enter on transactions for next year at a somewhat slight advance upon present prices.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At a meeting of the Peterhead Town Council, held last Thursday, it was resolved, on the motion of Mr. Reid, to remit to the Lighting Committee to consider the terms of the Burghs Gas Supply (Scotland) Act, 1876, as to the propriety of acquiring the property of the Peterhead Gas Company, and report to the council in time to admit of the necessary notice this year, as required by the Act, if the committee deem it desirable to adopt and take over the plant of the gas company.

The same subject cropped up at a meeting of the electors of Kirkintilloch last week. One of the electors asked the representatives of the Town Council who were present if they were in favour of the adoption of that Act of Parliament. In reply, it was stated by one of the councillors that the Act was in force already. "Great laughter" followed the reply, and no wonder, when it is remembered that the speaker was one of the local municipal authorities. Another member of council declined to answer the question, and a third said he questioned if ever there was a company in which the shares rose to such a value as in their gas company, which had been paying 10 per cent. He felt certain that if the works were transferred to the burgh the gas would be had at a much cheaper rate than at the present time, and if the question came up he would give it his earnest consideration.

The following motion has been given notice of for the next meeting of the Town Council of Glasgow:—"That nothing contained in the Standing Orders enacted by the magistrates and council on Feb. 23, 1857, shall prevent the Committee on Gas Supply from purchasing articles which they consider necessary for the proper carrying on of the gas undertaking, or from entering into contracts for coal or other commodities required for that purpose without having previously obtained the sanction of the Town Council." In connexion with this matter it should be mentioned that there is at present a movement in progress for placing the several independent municipal trusts more under the control of the Town Council, to which, indeed, they all belong. I refer to such bodies as the Gas Committee, the Water Committee, the Police Board, &c.

During the week ending the 2nd of December, the gas supplied by the Glasgow Corporation Gas Commissioners from the Dawsholm and Partick Stations was found on one occasion to be under the statutory illuminating power—24·90 candles and 24·92 candles respectively. The maximum ranged from 27·53 candles at Dawsholm to 28·73 candles at Tradeston. While speaking of Glasgow gas, I may say that there have recently been some complaints as to the impurities of the gas, so well founded and of so serious a nature that Dr. Wallace, the official gas examiner, has deemed it to be his duty to write to one of the daily papers, in order to explain what had really occurred.

On the afternoon of Sunday, the 3rd inst., a serious fire occurred at the Alyth Gas-Works, resulting in the destruction of a large portion of the retort-house. Mr. Mitchell, the manager, was absent from home at the time, and great consternation was felt in the town lest an explosion might occur. Fortunately, the fire was kept within the limits of the retort-house. An abundance of gas had been made, and consequently no material inconvenience arose at the public works or to the private consumers of gas.

Several extensive sales of Alyth gas stock have recently taken place. A local gentleman has disposed of twenty shares, originally of £5 each, at £7 10s. The same purchaser has also obtained twelve shares at the same price from a person who belonged to Forfar.

Mr. J. Falconer King reported to the last meeting of the Town Council of Edinburgh that on the 28th of November the gas supplied by the Edinburgh Gas Company had an illuminating power of 31·43 candles, while that supplied by the Leith Company had an illuminating power of 27·44 standard candles.

The quality of Dundee gas has just been under the consideration of the Gas Commissioners of that town, in consequence of complaints that have been made lately. It transpired, in the course of the discussion, that the illuminating power is rarely under 27 candles.

The gas made at Greenock during the last two months has ranged, in 26 tests, during November, from 27·57 candles to 32·10 candles, and in October from 28·17 to 32·03 candles.

In my next I shall have several interesting items of news to mention regarding water supply affairs in Scotland.

During the past week the price of pig iron has ranged from 58s. 6d. down to 58s. 1½d. per ton, and on Friday the closing prices showed a slight upward tendency.

The prices of coal continue firm, but the traffic has lately been much retarded by a scarcity of waggons.

GAS EXPLOSION ON SHIPBOARD.—The *Liverpool Mercury* reports that early in the morning of Wednesday, Nov. 29, an explosion of a very alarming character, resulting in injury to a number of lumpers and other labourers, occurred on board the Allan steamer *Prussian*, lying in the Wellington Dock, and under orders to sail on Thursday from the Mersey for Portland, Maine. The vessel was loading with a general cargo, and for the purposes of ballast nearly 200 tons of coal had been placed in the lower main hold. This coal had been put on board in a somewhat damp condition, but not the slightest idea appears to have been entertained that it would generate gas which might lead to an explosion. The coalheavers finished on the previous Saturday night, and having swept up the deck they placed the coverings over it, intending to proceed with the stowing of sugar and other cargo on the orlop deck. At the time mentioned on Wednesday, a number of lumpers or cargo men went below for the purpose of proceeding with the work, several of them having lamps in their hands. The moment the first man reached the orlop deck a frightful explosion took place, which blew off the covering of the main lower hold, and sent up a volume of flame many feet above the main deck. All the men who were below, or were in the act of going down, were more or less injured, most of them falling from the ladders which they were descending into the hold.

ASSESSMENT OF COAL.—On Friday, Nov. 24, a number of coalowners of the county of Durham appeared before the Lanchester Assessment Committee to appeal against the present assessment of coal. The case was one of great importance to coalowners, and the result is likely to have a great influence on the coal trade in all parts of the county. The owners said that at present coal was rated at 1s. 6d., per chaldron, and they felt that if the Assessment Committee did not give them immediate relief most of the collieries would have to be laid in. Many collieries were being carried on at a loss to the owners, one gentleman stating that he had sold coke at a loss of 2s. per ton at several of his collieries for the last two years. The coalowners also pointed out that there had been a large increase in the cost of production since the passing of the Mines Regulation Act, and as a proof it was stated that whereas in 1869 colliers were raising one million tons of coal, the same collieries were now producing 750,000 tons. It was decided to reduce the rate to 1s. 3d. per chaldron. The Lancashire and Cheshire Miners Association, which has been formed in connexion with the Miners National Union, and has already branches established in many of the colliery districts in the two counties, has issued 14 days notices for an advance in miners wages, to make them equal to what they were in May last. Should the request not be complied with under the expiration of the notice, the men hold themselves at liberty "to take such course and adopt such measures" as they may deem necessary for their interests. —*Iron.*

MANCHESTER NEW GAS-WORKS.—The *Manchester Guardian*, in an article upon the improvements which are being carried out in the above city, refers as follows to the Corporation New Gas-Works:—"Another extensive work which the corporation have in hand is the construction of the new gas-works near Philips Park. Some idea of the magnitude of this undertaking may be formed when it is stated that its cost will probably amount to between £800,000 and £1,000,000. It will be by far the largest and most important establishment in charge of the Gas Committee. In the course of a few days specifications will be issued and tenders invited for the excavations and the construction of the brickwork, and probably, in a fortnight or a little more, the first contract will be let. There are upon the site immense beds of fire and brick clay, which the committee, of course, intend to utilize. They will manufacture the bricks required in the construction of the works, and dispose of them to the contractors, whoever they may be, at the rate of 24s. per 1000. Amongst the works contemplated is the formation of an immense wharf, abutting on the canal which runs close past the site. A wharf so close to the works will be of great advantage in the conveyance of coal and other materials required for the manufacture of gas, and will also be convenient in sending away the waste products of the works. We are informed that Mr. Littlewood, the present manager of the Rochdale Corporation Gas-Works —son of Mr. Littlewood, the architect of the new works—will be transferred from his present duties in or about the month of May next, and placed in charge of the new works, the construction of which will then be about commencing. The Parks and Cemetery Committee are satisfied with the action which has been taken by the Gas Committee to obviate any nuisance or injury to Philips Park. With a view to the new works being the least possible nuisance, the Gas Committee have, within the past two months, purchased a plot of land adjacent to the site of the new works, and upon this plot the gasholders will be placed. The distance will be such as to render the holders and other works entirely unobjectionable."

WASTE OF WATER AT GLASGOW.—At the meeting of the Glasgow Water Committee on the 27th ult., the engineer, Mr. Gale, laid before them a report with reference to the waste of water in the Great Western Road experimental district. The following table shows the consumption per head at the starting of the meters, the lowest quantity reached, and the consumption during the last week of September, when the observations ceased:—

Number and Name of District.	Number of Occupiers at Night.	Gallons per Head per Day.			
		At Starting of Meter.		Last Week of September.	
		Total.	Night Rate per 24 Hours.	Total.	Night Rate per 24 Hours.
1. Lansdowne	988	46·8	37·0	41·1	26·4
2. Napiershall Street	640	81·8	64·0	50·7	31·8
3. Burnbank	1,345	68·3	45·7	36·1	17·5
4. Carrington Street	1,154	57·7	46·2	35·5	24·6
5. St. George's Road, North	737	60·9	59·4	50·8	36·0
6. St. George's Road, South	1,784	71·1	63·3	29·1	16·3
7. Scotia Street, North	3,016	60·0	42·5	28·2	11·3
8. Scotia Street, South	2,618	60·0	43·1	32·8	19·1
9. New City Road	3,408	47·5	34·3	28·5	12·7
Total	15,690	..	..	..	..
Averages	..	59·2	45·0	33·1	18·1

The average consumption in all the districts was 59·2 gallons per head at first, which was reduced at the lowest point to 26·6; but in the last week of September, which was four weeks in some districts, varying to three months in others, after the inspection had ceased, it had risen to 33·1 gallons per head. All these quantities include the ordinary trade and meter supplies, but those are not very large in this district. Taking the initial consumption at 60 gallons per head per day, and the present consumption at 35 gallons, there has been a saving of 25 gallons per head per day, which corresponds very nearly with the saving effected under the first trial district meters. Less reduction was made in the Lansdowne district than in most of the others, arising very much from the greater part of the houses having been shut up during the summer, and thus preventing any inside inspection. With reference to the cost of the experiment, Mr. Gale quotes figures to show that the outlay for inspection amounted to about 12s. 3d. per day, to which he adds 4s. 4d. as the interest on the capital sums expended in purchasing and fixing the meters and altering pipes and service-cocks, making in all a daily expenditure of 16s. 7d. The report then proceeds: "The saving of water I have shown to have been 25 gallons per head per day, which, over the 15,690 persons in the district, amounts to 392,250, or, say, 400,000 gallons per day. At the cost price of the water this is equal to £4 per day, and calling the expense £1 per day, there would be a net saving of £3 per day. *The Application of the System.*—The population within the limits of supply at present is about 720,000, and if, with the experience now obtained, an average of 2000 persons to one meter could be got, the number of meters required to bring the whole under this system would be 360, and if the alterations of piping and cost of repairing the service-cocks was the same per district as in these, there would be an outlay required of £27,985 10s.; but as the price of the meters is to be raised, and as there may be additional cost to get 2000 persons to each district, the outlay may run up to £36,000. The inspection, taking it at 12s. 3d. per day for 15,690 persons, or 9¼d. per day per 1000, would amount to upwards of £10,000 per year, and there would have to be about 120 inspectors. It is very probable, however, that many portions of the town would not require the attention I have assumed, and that inspections at periods of six months after the first thorough overhaul would be sufficient to keep the consumption within reasonable bounds. With so large a proportion of proscribed fittings and light lead pipes, it would be necessary, for some time at first, to make frequent inspections in most of the districts. I have assumed nine weeks as the period which ought to elapse between the inspections, so that the proscribed fittings may be brought within the present orders of the committee. If a longer period were allowed, say six months, within which time proscribed fittings found wasting water twice were ordered to be removed, less frequent inspection would soon reduce them in number, and the cost of future inspections would be very much diminished. The testing and stamping department about to be inaugurated will soon introduce a better class of fittings, and this in time will also tend to reduce the necessity for frequent inspection. There can be no doubt of the success attending the operations in this experimental district; but, from a consideration of all the circumstances, I think it would not be proper to provide at present for an extension of this meter system to more than five times the area at present under it, or say to 80,000 people, including the Great Western Road district, the first inspections being made three or four times, at intervals of three weeks, and then continued subsequently at intervals of nine weeks. This number of 80,000 will require about 40 meters, and the results obtained should be valuable in considering the extension of the system over the whole area of supply, and will show whether a less frequent inspection than once in nine weeks will suffice. The total outlay for 80,000 people for meters alterations of pipes, &c., will, on the data obtained in this district, be from £3200 to £3500, and the expense of inspection will gradually increase to—

One district at £1 16s. 10d. per day	£1 16 10
Four districts at 12s. 3d. per day	2 9 0
	£4 5 10

or at the rate of £1566 9s. 2d. per year; but after the first inspections were over this would fall to about £1100 per year, and would require the attention of about 13 inspectors, unless, as I have said, the frequency of the inspection can be reduced."

BLACKBURN GAS-WORKS.—The directors and officers of the Blackburn Gas Company, with a number of invited guests, supped together on the 23rd ult., to celebrate the completion of the extensions at the No. 2 station. Mr. Harrison, chairman of the company, presided, and Mr. Hoyle occupied the vice-chair. After the usual loyal toasts, Mr. Seddon, of Wigan, proposed "Success to the Blackburn Gas Company." Having spoken of the satisfaction which an inspection of the works had afforded him, Mr. Seddon referred to the intended application of the corporation to Parliament for power to purchase the undertaking. In connexion with the negotiations which must attend such a course, he strongly counselled moderation, for he presumed that the corporation did not require anything but what was fair, and if the company displayed the spirit he would enforce, the matter could be settled satisfactorily to both sides. Alderman Pickup responded to the toast, and in doing so made some interesting statements respecting the early history of the company. He said he remembered the time when Blackburn was lighted with oil-lamps; and when, in 1818, the introduction of gas was determined upon, the company conducted their operations without the sanction of an Act of Parliament until 1838. Since their establishment they had had six chairmen and six engineers. The only original shareholder still living was Mr. Robinson, a gentleman now in his 81st year, and a guest on the present occasion. Alderman Thompson proposed the health of Mr. Ogden, the company's engineer, whom he complimented very highly for the ability and energy displayed during the reconstructions and extensions just completed. Mr. Ogden, in returning thanks, entered minutely into a description of the works carried on under his superintendence. He was appointed engineer of the company in November, 1875, and during the twelve months succeeding he had had to prepare plans and specifications, and to see carried into execution works which had cost upwards of £40,000, including a new retort-house, a 110-feet gasholder, condensers, exhausters, purifiers, &c. It had been a year of anxiety to him, but he had been ably assisted by the contractors for the several departments, and by the other officers. It was very gratifying to him to find the whole so ably completed, and to find that his exertions had met with the approval of the board. "The health of the contractors" was responded to by Mr. Robert Dempster, of Elland, who pointed out the many difficulties with which Mr. Ogden had had to grapple from the time the architectural and engineering works had sprung from the river's brink to their present symmetrical proportions. Alderman Bury proposed "The town and trade of Blackburn," which was duly honoured. Alderman J. Lewis, in responding, alluded to the action of the corporation in reference to the gas-works, and recommended the parties to approach each other in a spirit of fair play, believing if that were done there could be a satisfactory settlement obtained. Other toasts followed, and the evening was spent most agreeably.

GAS LIGHTING.—The quality, as well as the price, of the gas supplied by the great metropolitan companies is a question of vital importance to consumers, and it becomes more and more so as the days shorten, and the atmosphere thickens. These things are happening now, and the time, therefore, is not inopportune for giving a practical hint or two as to methods of testing the purity, or otherwise, of the illuminating medium. Many persons have a strong suspicion that what passes through their meters, is registered by them, and for which they have to pay so heavily, is not all gas. In fact, if air only were forced through gas-meters, they would register its delivery in the same way that they do now; and if air be intermixed with the gas, consumers will have to pay the same price for each ingredient. This latter arrangement is the one most to be feared, and, without charging the companies with making it, we venture to explain a mode by which its existence may be detected. The apparatus for this purpose is by no means complicated, and the chemical knowledge necessary for using it effectually may be readily imparted. For example, let a pint bottle, having two necks instead of one, be taken, and the necks be fitted with hollow corks for the reception of glass tubes. Into the bottle put first half an ounce of anhydrous sulphate of manganese previously dissolved in one ounce of warm water. Then add two ounces of tartarized soda, also dissolved previously in three ounces of warm water. When these ingredients are thoroughly incorporated, half a pint of caustic solution of potash may be added, and the whole should be then well shaken and mixed together, so as to form a clear solution. After this the upper ends of the glass tubes must be closely

corked, so as to exclude the external air, and next one of them should be pushed down until it dips below the surface of the liquid. The other tube may have its inner and open end projecting slightly below the cork. The apparatus thus charged and arranged may be termed a detector, and is ready for its work. In fact, all that is now required is to attach a flexible tube and stopcock to the gas-burner of a chandelier or bracket, and to the uncorked mouth of the dipping-tube. The cork of the outer tube must now also be removed. A stream of gas flowing, say, at the rate of about one cubic foot per hour, may thus be made to pass through the test fluid. At the beginning of this latter experiment the liquid is clear, and almost colourless as water; and with pure coal gas passing through it would remain so throughout. If, however, on the contrary, the gas be mixed with air or oxygen, a change will be quickly observable. The fluid will then assume, first a dark brown hue, and finally something like the appearance of London porter or stout. Chemically speaking, these changes are due to the fact that the colourless protoxide of manganese is converted into the black hydrated sesquioxide, by the agency of the oxygen in the air. At any rate, we have the satisfaction of promulgating a simple plan by means of which the public may, with certainty, discover whether their heavy gas bills arise solely from a fair charge made for a pure article, or are weighted, to an inordinate and unjust degree, by unfair demands for an adulterated gas supply.—*Echo.*

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

4554.—Paterson, J., Edinburgh, "Improvements in apparatus for turning and tightening keys in brass and other metal cocks." Nov. 24, 1876.
4559.—Kidd, J. and J., Wandsworth, London, "Improvements in apparatus for manufacturing and carburetting gas." Nov. 24, 1876.
4563.—Kelen, L. Van der, Brussels, "Improvements in gas-stoves." Nov. 25, 1876.
4576.—Mathieson, C. F., Mincing Lane, London, "Improvements in the manufacture of gas." Nov. 25, 1876.
4585.—Russell, T., Cleveland Square, London, "A new or improved method of charging and drawing gas-retorts." A communication. (Complete specification.) Nov. 27, 1876.
4588.—Lake, W. R., Southampton Buildings, London, "Improvements in couplings or connexions for tubes or pipes." A communication. (Complete specification.) Nov. 27, 1876.
4613.—Young, W., Clippens, Renfrew, "Improvements in the manufacture of illuminating gas." Nov. 29, 1876.
4668.—Thorpe, C., and Prince, H., Manchester, "Improvements in the construction of direct-acting steam-pumps." Dec. 2, 1876.
4675.—Howard, E., Walthamstow, Essex, "Improvements in apparatus for preventing waste of water in water supply to closets, drinking fountains, wash-hand basins, and other water supply appliances." Dec. 2, 1876.
4690.—Whitton, W. B., Branksea Island, Dorset, "Improvements in drain-pipes, and for the adaptation of such pipes for the conveyance of gas and water." Dec. 4, 1876.
4699.—Lake, W. R., Southampton Buildings, London, "Improvements in valves for controlling or regulating the flow or passage of steam or other fluids." A communication. Dec. 5, 1876.
4717.—Thorpe, C., and Prince, H., Manchester, "Improvements in condensers." Dec. 6, 1876.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2314.—Deacon, G. F., Liverpool, "Improvements in valves for reducing or regulating fluid pressure." June 1, 1876.
2316.—Saxby, F. E., Windsor, Liverpool, "Improvements in and relating to valves for reducing or regulating the pressure in mains, pipes, and other conduits." June 1, 1876.
2360.—Schnell, J. F., Castleford, York, "Improvements in lamps and burners, and in the means or apparatus employed for generating gas for the same from benzoline for illuminating purposes." June 6, 1876.
2374.—Dann, J. T., North Brixton, London, "Improvements in the construction of apparatus for lighting, extinguishing, and regulating gas flames." A communication. June 7, 1876.
2387.—Lovell, T., Nuneaton, Warwickshire, "Improvements in purifying sewage, and in the means and apparatus for effecting the same." June 7, 1876.
2409.—Fison, F. W., Ilkley, York, "Improved means or apparatus for exhausting gas-retorts." June 10, 1876.
2556.—Parker, T., and Weston, P. A., Coalbrookdale, Salop, "Improvements in direct-acting steam-pumps and in steam-engines." June 20, 1876.
3370.—Redfern, G. F., Finsbury, London, "Improvements in gas motor-engines, and in apparatus connected therewith." A communication. Aug. 28, 1876.
3510.—Anderson, R. C., Wood Green, London, "Improvements in valves." Sept. 6, 1876.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3353.—Clark, A. M., "Improvements in the manufacture of artificial fuel, and in the production of gas for illuminating and heating purposes." Oct. 16, 1873.
3372.—Belt, A., "Improvements in safety gas-burners." Oct. 18, 1873.
3383.—Quick, J., jun., and Restler, J. W., "Improvements in apparatus for measuring the passage of water and other liquids, also for pumping purposes." Oct. 18, 1873.
3441.—Siegers, L., "Improvements in the construction and arrangement of apparatus for economizing the consumption and increasing the illuminating and heating powers of coal gas, water gas, and other inflammable vapours and gases, and mixtures thereof." Oct. 23, 1873.
3478.—Worth, R. J., "Improvements in steam-pumps." Oct. 27, 1873.
3487.—Hazeltine, G., "An improved motive-power engine to be operated by the pressure of water, steam, or compressed air, and capable of use as a pump, blowing engine, or gas-exhauster." Oct. 27, 1873.

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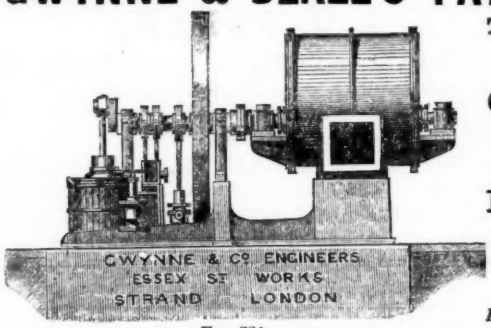

Fig. 224.

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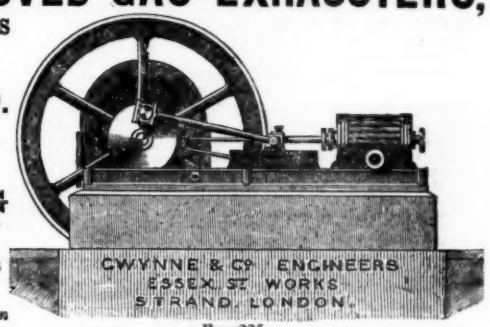

Fig. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the most perfect system of action yet discovered. Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the excellence of the article produced, and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

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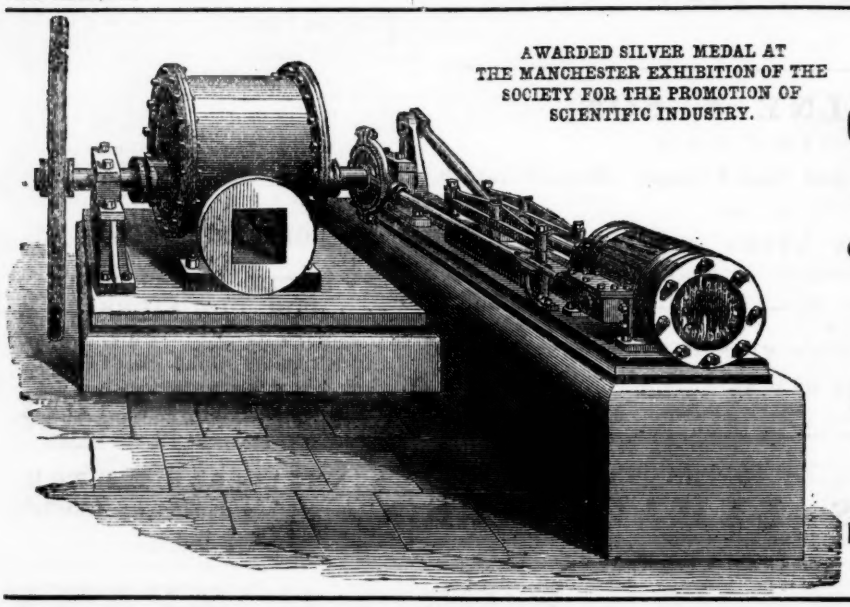

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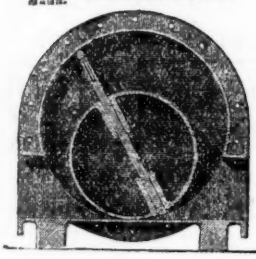

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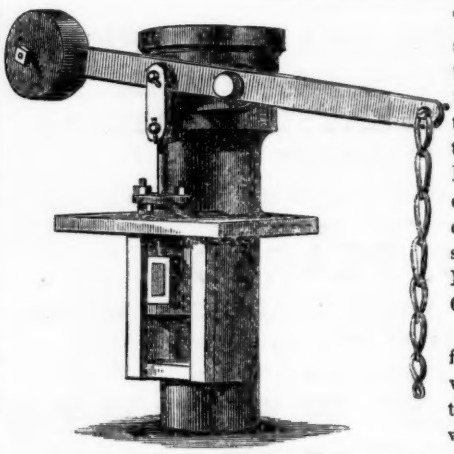

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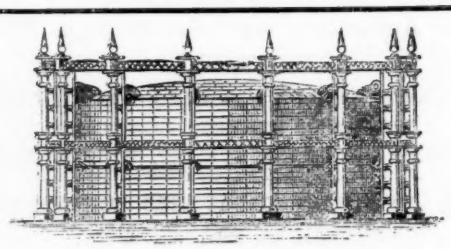

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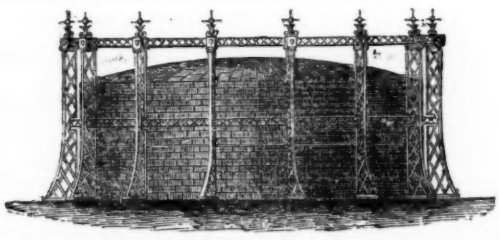

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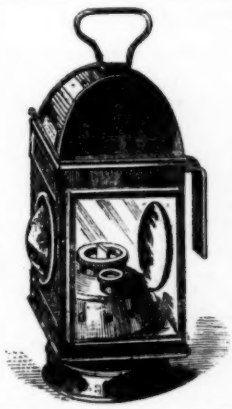

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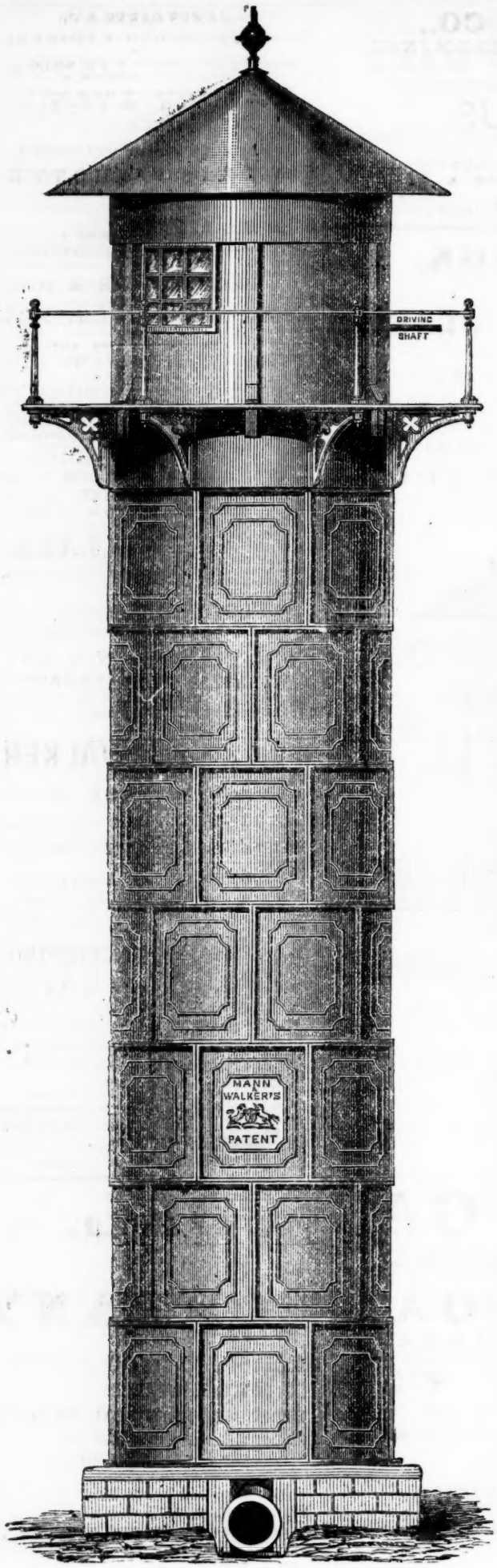

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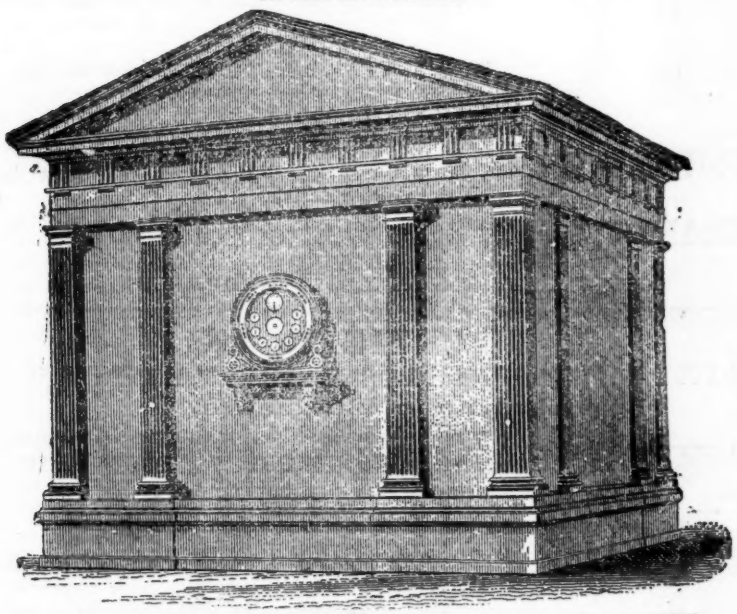

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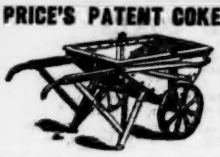

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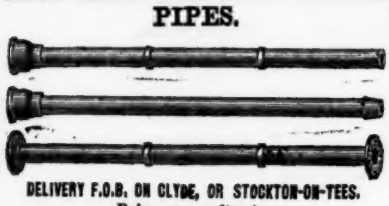

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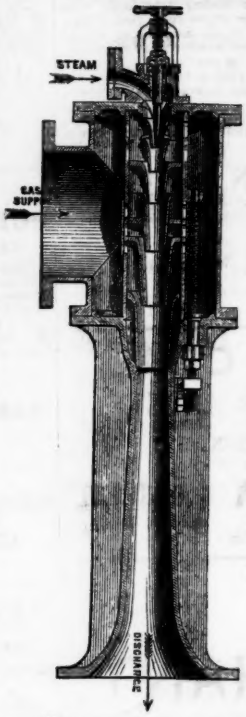

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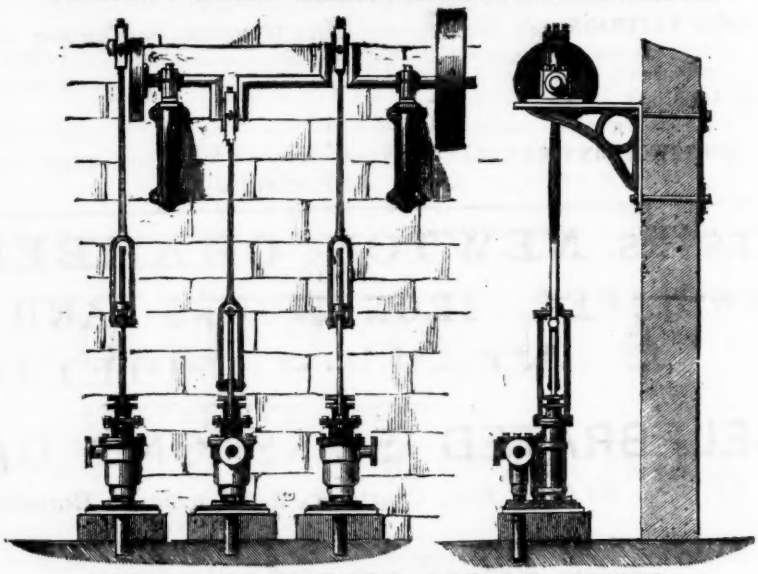

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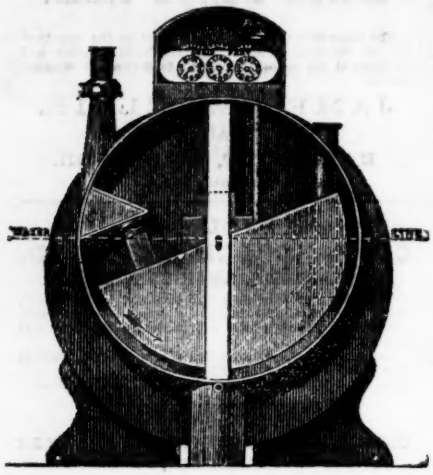

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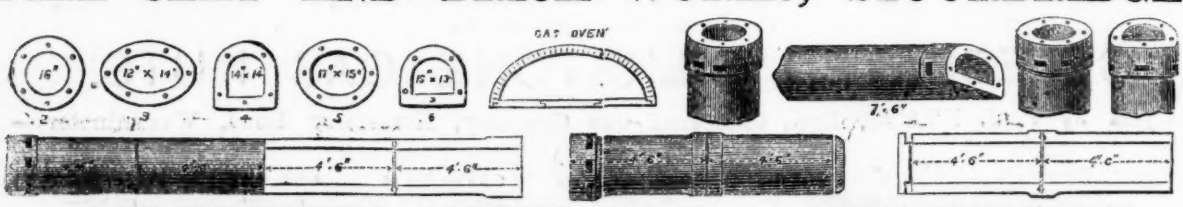

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